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ERRATA

page 11 line 24 for '*Sphacelotheca reiliana*' read '*Sorosporium reilianum*'
46 1 for 'Bingham (T. R.)' read 'Bingham (R. T.)'
56 12 delete 'and *U. nuda*'
103 2 for '153, 158' read '153–158'
103 8 for '*edulis, Lactarius*' read '*edulis* and *Lactarius*'
125 4 for '*Eutellix*' read '*Eutettix*'
127 6 for '*tracheiphilum*' read '*niveum*'
127 7 for '*calocynthis* read '*colocynthis*'
137 23 for 'Ferreira (L. A.)' read 'Ferreira (A. L.)'
138 39 for '*Strachybotrys*' read '*Stachybotrys*'
143 42 for '*Zygospichia*' read '*Zygopichia*'
155 lines 6 and 13 for '*Achyla*' read '*Achlya*'
184 19, 28, and 33 for '*saccharatum*' read '*saccharum*'
216 line 18 for 'Florida' read 'São Paulo'
344 52 for 'bacterial' read 'bacteria'
361 45 for '*Sphaceloma*' read '*Sphacelotheca*'
387 10 for 'fungisal' read 'fungisul'
396 23 for 'Hopkins (C. J. F.)' read 'Hopkins (J. C. F.)'
405 49 for '*silvaticum*' read '*silvaticus*'

IMPERIAL MYCOLOGICAL INSTITUTE

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REUTHER (W.) & BURROWS (F. W.). **The effect of manganese sulfate on the photosynthetic activity of frenched Tung foliage.**—*Proc. Amer. Soc. hort. Sci.*, xl, pp. 73–76, 1 fig., 1942.

Frenching of tung trees [*Aleurites fordii*] is stated to have been quite prevalent in localized areas in numerous plantings in the north-central part of Florida during 1941. A limited number of measurements suggests that severely affected trees have smaller leaves and less shoot growth than normal. In continued tests with manganese sulphate [*R.A.M.*, xvii, p. 781] simultaneous measurements of the rate of apparent photosynthesis were made on selected comparable leaves of 15-year-old tung seedlings, both untreated and dipped in a solution containing 1 per cent. manganese sulphate and 0·5 per cent. calcium carbonate. The experimental data do not suggest any very pronounced effect of the treatment on the rate of photosynthesis, or that frenching is a very serious yield-reducing factor. There was no noticeable effect during the first fortnight after the treatment; during the following 2½ weeks there was a significant stimulation of photosynthetic activity in the shoot leaves (on the current season's shoot growth), but none in the basal leaves (the first to unfold in the spring), the figures for the mean rate of photosynthesis, expressed as mg. carbon dioxide per 100 sq. cm. of leaf area per hour, being 8·68 and 7·95 in two lots of treated and 6·89 and 6·31 in the parallel lots of untreated shoot leaves, but 6·79 in the treated and 7·20 in the untreated basal leaves. There was practically no interveinal chlorosis of the basal leaves, whereas the shoot leaves were quite generally affected to some degree, the more severely affected of them showing a marked response to manganese treatment. In a series of comparisons made during the latter part of August and early September, both the treated and the untreated leaves resumed the normal green colour. It has frequently been observed that trees with fairly pronounced frenching symptoms on the young shoot leaves early in the spring and summer showed scarcely any chlorotic foliage later in the season.

WRIGHT (E.). **Cytospora abietis, the cause of a canker of true Firs in California and Nevada.**—*J. agric. Res.*, lxv, 3, pp. 143–153, 2 figs., 1 map, 1942.

A disease of white fir (*Abies concolor*) and red fir (*A. magnifica*), observed for the first time in 1929 in the forests of the northern Sierra Nevada, is stated to be due to attacks by a fungus tentatively identified, in the absence of the mature perfect stage, as *Cytospora abietis*. The fungus usually first enters the lower branches, probably through a wound or a fire scar, and thence spreads into the main stem and the branches above, causing a flow of resin, the formation of elliptical cankers, and a die-back of the branches (mostly those less than 1 in. in diameter) by girdling, within one to several years of infection. Yellow spore horns develop from raised pycnidia in the late spring and early summer, and are particularly abundant after rainy periods. On red fir the fungus was commonly found associated with mistletoe hypertrophies. The disease is favoured by drought, particularly in weakening fast-growing

firs previous to infection, while its spread is helped by bark beetles, aphids, and ants. In pathogenicity tests, unsatisfactory results were obtained from slit inoculations, whereas the cork-borer method (consisting in forcing a No. 2 cork-borer through the bark down to the xylem, placing the inoculum in the hole, and adjusting the bark disk on top of it by a strip of waterproof adhesive tape) gave 13·6 per cent. infection in branches of healthy and 94·9 per cent. in those of naturally infected trees, indicating the semi-parasitic nature of the fungus. Isolates of *C. abietis* from white and red fir, when placed in the same Petri dish, showed a tendency to mutual aversion, but in a series of cross-inoculations both isolates readily infected either host with an equal degree of virulence. It is concluded from these studies that the fungus is endemic in the forests of the Sierra Nevada and only assumes epidemic proportions when the firs are weakened by drought or some other environmental factor.

Cartwright (K. St. G.) & Findlay (W. P. K.). **Principal decays of British hardwoods.**—*Ann. appl. Biol.*, xxix, 3, pp. 219–253, 6 pl., 1942.

Continuing their earlier studies [*R.A.M.*, xviii, pp. 221, 361], the authors give full descriptions of the principal forms of fungal decay attacking British hardwoods other than oak. The most prevalent fungi causing decay in standing trees of the common British broad-leaved species are listed under the trees affected, viz., alder, ash, false acacia (*Robinia pseud-acacia*), beech, birch, cherry, horse-chestnut (*Aesculus hippocastanum*), sweet chestnut (*Castanea sativa*), elm, lime (*Tilia vulgaris*), oak (*Quercus robur* and *Q. petraea*), pear, apple, plum, poplar, sycamore (*Acer pseudoplatanus*), walnut, and willow (*Salix* spp.). The chief diagnostic features of the more important fungi attacking ash, beech, elm, and willow, and fallen hardwoods in general are presented in a series of tables. Detailed descriptions are given of the following fungi causing deterioration in felled and stored hardwoods, of their appearance in culture and their physiological characteristics, together with notes on the rots caused, and their economic importance: *Armillaria mucida* [ibid., xvii, p. 363], *Daldinia concentrica* [ibid., xviii, p. 356], *Fomes fomentarius*, *F. ulmarius* [ibid., xviii, p. 4; xxi, p. 59], *Ganoderma applanatum*, *Pleurotus ostreatus* [ibid., xix, p. 658], *Polyporus betulinus*, *P. cuticularis* [ibid., xvi, p. 425], *P. giganteus*, *P. hispidus*, *P. radiatus*, *P. squamosus*, *Polystictus versicolor*, *Poria obliqua*, *Stereum purpureum*, and *Ustulina vulgaris*. Of these *P. versicolor* [ibid., xx, p. 142] is treated in the fullest detail, as being, probably, the most important.

Grant (T. J.), Stout (D. C.), & Readey (J. C.). **Systemic brooming, a virus disease of Black Locust.**—*J. For.*, xl, 3, pp. 253–260, 4 figs., 1 graph, 1942.

Data obtained from the examination and identification of black locust (*Robinia pseud-acacia*) specimens affected by witches' broom [*R.A.M.*, xii, p. 405; xvi, p. 717] show the disease to have been present in North Carolina and Pennsylvania for over 70 years and establish its occurrence in Delaware, Virginia, District of Columbia, and Georgia prior to 1900. Intensive greenhouse and field studies of the disease have revealed the existence of degrees of the trouble ranging from severe through mild brooming to the symptomless presence of the virus in apparently healthy trees. Vein-clearing of the leaflets is an outstanding feature of the disorder in the early stages, and is also the last symptom to be observed on plants recovering from other manifestations of witches' broom. Length and width measurements (by W. G. Cullen) of 1,080 leaflets showed the average mildly affected specimen to be about half, and a severely diseased specimen one-thirteenth as large as a normal leaflet. On the basis of 225 measurements the average lengths of comparably situated petioles were 18·7, 12·5, and 2·7 cm. for healthy and mild and severe brooming, respectively; a tendency to curling and twisting of the petioles is apparent on diseased plants. Foliar symptoms are confined to leaves in which infection was already apparent before expansion in the leaflet stage; these are apt to turn yellow and fall abnormally

early. The characteristic proliferations of buds and branches arise from the continuous development of the axillary buds into short, succulent branches bearing leaves and leaflets of reduced size and modified shape. Frequently a leaf with a branch of this type in its axil drops from the plant, to be replaced by one or more subpetiolar buds. Very severe brooming may be accompanied by adventitious bud formation, but more commonly the branches arise from normally located buds. Excessive branching usually involves a reduction in height increment, and diseased plants often fail to survive competition in crowded stands. Root brooming is a sequel to the repeated arrest of terminal growth. Of 279 root cuttings from broomed plants, 67 per cent. made no growth, 20 per cent. produced apparently healthy sprouts, while only 13 per cent. gave rise to sprouts with witches' broom symptoms, those severely affected living only for a few months, whereas in milder cases transplanting was survived. Of 120 controls from healthy plants, 33 per cent. failed to grow, and the remainder produced sound sprouts.

Witches' broom of black locust is most prevalent on young sprouts in areas where the plant growth has been repeatedly cut back or the roots cut, e.g., highway and railway banks, building lots, gardens, and ploughed fields. Spring observations of 629 first-order branches bearing old brooms showed that 55 per cent. were entirely dead, 36 per cent. were alive in the lower portion, and in only 9 per cent. was there evidence of new growth developing over the whole length, the corresponding figures for mild broom being 28, 55, and 17 per cent., respectively.

By grafting diseased scions on healthy stocks, the transmission of witches' broom was effected in 19 to 50 per cent. of the 150 plants used in several different tests, whereas budding was successful in only two plants out of 30 and negative results were given by attempts to infect healthy plants by means of juice extracts and insects.

ROLDAN (E. F.). **Nursery wilt of Mahogany seedlings.**—*Philipp. J. For.*, iv, 3, pp. 267–277, 3 pl., 2 figs., 1941.

An epidemic of wilt, involving some 27,000 out of 300,000 mahogany (*Swietenia macrophylla*) seedlings in the Makiling National Park, Manila, broke out during the early part of 1939, the conspicuous symptoms of prostration and a dull green to brownish discoloration and drooping of the leaves developing quite suddenly. The disease was uniformly fatal, and further observations in the infected patches showed that many of the seeds had rotted without germinating. The fungus isolated from the affected plants on various standard media proved to be a species of *Sclerotium*, which was identified on the basis of its diagnostic characters, including sclerotial measurements (0·63 to 5·17, average 2·5 mm.), as *S. delphinii*, the agent of seed and seedling stem rot of the mango in the Philippines [*R.A.M.*, xiii, p. 387]. In three series of inoculation experiments with sclerotia from pure cultures of the fungus on potato dextrose agar positive results were obtained in 14, 19, and 10 out of 24 seedlings (58, 79, and 41 per cent., respectively), and in all four mango seedlings similarly treated. Control measures should be based on the avoidance of conditions favouring the development of the pathogen (the first to be recorded on mahogany in the country), e.g., shady sites with a low temperature and high humidity, and overcrowding of the seedlings.

AGUILAR (L.). **Relative durability of untreated Philippine woods (a progress report).**—*Philipp. J. Agric.*, iv, 3, pp. 247–256, 2 pl., 1941.

Tested since 1907 by the 'graveyard' method, in which samples of wood are inserted partially or wholly in the ground and exposed to decay by termites and fungi, at least ten native Philippine timbers proved to be more durable than *Intsia bijuga*, which was taken as the standard and given the value of 100 per cent., its average life under the experimental conditions being 11½ years. They were *Xanthostemon verdu-*

gonianus, Vitex parvifolia, Vatica spp., *Shorea seminis, S. astylosa, S. gisok, Mimusops parvifolia, Hopea mindanensis, Tristania* sp., and *Pahudia rhomboidea,* with percentages of 224, 184, 171, 121, 110, 110, 108, 105, 104, and 102, respectively. Using an arbitrary classification of (1) very durable, i.e., a relative durability of 80 per cent. and over, (2) durable (40 to 79 per cent.), (3) moderately durable (21 to 39 per cent.), (4) perishable (10 to 20 per cent.), and (5) very perishable (less than 10 per cent.), 25, 26, 34, 47, and 50 species, respectively, fell into the five categories. The very durable woods may be expected to resist decay for nine years and upwards under the most exacting conditions.

Bland (D. E.). **A study of the toxicity of Australian vertical retort creosote oils to Lentinus lepideus Fr., Polystictus versicolor (L.) Fr., and Madison 517.**—*J. Coun. sci. industr. Res. Aust.*, xv, 2, pp. 135–146, 1942.

Australian vertical retort creosote oils were shown experimentally to exhibit substantially the same toxicity to the wood-destroying fungi *Lentinus lepideus, Polystictus versicolor,* and Madison 517 [*R.A.M.*, xvii, p. 5] as horizontal retort oils. Vertical retort oils of lower creosote boiling range were more toxic than those of higher range. The most toxic fraction of vertical coal-tar oil was that distilling between 225° and 275° C. Most of the toxicity of the vertical retort oils was found to be due to the tar acids, the most toxic fractions of which were those boiling at over 250°. The constituents of a creosote oil were not found to act independently of one another.

Bowen (J. W.). **The preservation of timber and fabrics with reference to utilization underground.**—*J. chem. Soc. S. Afr.*, xlii, 5, pp. 122–135, 5 figs., 3 graphs, 1941.

Much of the information presented in this useful survey of investigations on the preservation of mining timbers, consisting almost exclusively of wattle [*Acacia mollissima*] and *Eucalyptus saligna,* in South Africa has already been noticed from another source [*R.A.M.*, xxi, p. 109], but the following points are of interest. Generally speaking, the attacks of fungi of the white rot group, e.g., *Polyporus rugulosus* and *Polystictus versicolor,* do not appreciably change the proportions of the different constituents of the wood, whereas the brown rots, such as *Coniophora cerebella* [*C. puteana*] and *Hydnum* sp., bring about a considerable reduction in pentosans and cellulose relative to the percentage lignin. In 1935 6,000,000 cu. ft. of timber for the Witwatersrand mines underwent preservative treatment, the corresponding figure for 1937 being 8,000,000 and that estimated for 1942 25,000,000 cu. ft.

Since 1925 experiments have also been in progress at the Timber Research Laboratory, Transvaal Chamber of Mines, to determine the most effective method of protecting the various fabrics used underground against fungal decay, e.g., by *Penicillium canescens,* which has been found to destroy untreated flannel air-filtration bags, worth £3 to £10 each, in less than a month. The best protection of this material has been afforded by cuprinol [ibid., xviii, p. 726], while shirlan, halogenated soaps, cutch, and copper oleate [ibid., xix, p. 95], iron and chromium hydroxide, thallium carbonate, sodium silicofluoride, the copper salts of fatty acids, creosote, copper carbonate, and zinc chloride have also given good results in tests for special purposes.

Christensen (C. M.), Kaufert (F. H.), Schmitz (H.), & Allison (J. L.). **Hormodendrum resinae (Lindau), an inhabitant of wood impregnated with creosote and coal tar.**—*Amer. J. Bot.*, xxix, 7, pp. 552–558, 2 figs., 1942.

A fungus tentatively identified as *Hormodendrum resinae* was recently isolated from various creosoted wood products, such as railway sleepers, poles, and fence

posts, in many different parts of the United States, where it appears to be a very common and general inhabitant of wood impregnated with coal tar and coal tar creosote. Nearly all attempts to isolate the fungus from creosoted wood blocks, plant refuse, soil, and asphalt street pavements gave negative results, but resinous bark and twigs from 15 spruce trees affected with *Cytospora* canker gave *H. resinae* in 13 instances. This and other resinous woods may possibly form one of the natural habitats of the organism.

Cultures of the fungus on malt and potato dextrose agars are white when very young but turn dark olive-brown or nearly black in a few days. The mycelium is appressed but the numerous spores give the cultures a powdery appearance. The spores are pale olive-brown, from spherical to elongate-oval, 3·2 to 9 (average 4·5) μ in length (average of 5·1 μ for a strain isolated from western red cedar [*Thuja plicata*]). *H. resinae* has a high optimum temperature (about 30° C.) and a wide temperature range (from 5° to 40° at least). It grew over a wide P_H range at very varying rates and altered the P_H value of the medium. It was moderately resistant to arsenic, and extremely tolerant of coal-tar products, growing on agar containing as much as 10 per cent. creosote or coal-tar, whereas *Coniophora cerebella* [*C. puteana*], Madison 517, *Lenzites sepiaria*, and *Trametes serialis* were killed at creosote concentrations of 0·05, 0·3, 0·3, and 0·2 per cent., respectively. It appears to derive nourishment from the constituents of typical coal-tars and creosotes used as wood preservatives. It grew luxuriantly on wood sterilized to eliminate all competitive fungi (*Penicillium*, *Aspergillus*, and *Trichoderma* spp.) but was unable to compete with these organisms. Other experimental evidence indicated that it cannot long survive in the soil in competition with other fungi.

That the fungus has no appreciable effect on the strength of the wood it infects was indicated by the excellent condition of the samples, and this view was confirmed experimentally.

An unidentified bacterium was isolated from most of the pieces of creosoted wood from which the isolations of *H. resinae* were made.

NARAYANAMURTI (D.). **A short note on wood preservation for users in India.**—*Indian For. Bull.*, N.S., Utilis., 110, 21 pp., 4 pl., 1 diag., 1941.

Following an outline of the history, aim, and scope of timber preservation, with special reference to Indian conditions, the standard methods of impregnation with oils, water-soluble preparations, and toxic chemicals dissolved in volatile solvents, are described and discussed in relation to the practical and economic aspects of the various procedures [*R.A.M.*, xix, p. 632]. Brief supplementary notes are given on the protection of logs and poles by air-seasoning, and on the prevention of decay in buildings.

LE BEAU (F. J.) & PINCKARD (J. A.). **Oospore production in Cabbage seedlings by Peronospora parasitica.**—Abs. in *Phytopathology*, xxxii, 7, p. 648, 1942.

Oospore formation by *Peronospora parasitica* was abundant in the cotyledons and sparse in the true leaves of field-grown cabbage seedlings in south-central Mississippi, where the process was apparently related to moisture, temperature, and light intensity, the fructifications being most profuse in the tissues of seedlings in dense stands on the south side of wood-enclosed frames during November and December. Dry, sunny periods were found to interrupt the heavy production of oospores occurring in rainy weather by the desiccation of the invaded tissues supplying the fungus with food. In the greenhouse cabbage seedlings surrounded by cheese-cloth produced large numbers of oospores for 15 days after inoculation in the presence of a continuously moistened atmosphere. The life-cycle of *P. parasitica* would thus appear to conclude

with oospore production, chiefly in the cotyledons, oversummering being effected by means of these bodies rather than by perennial mycelium in weed hosts.

MOGILEV (L. M.) & RYACHOVSKY (N. A.). Устойчивые к аскохитозу **(Ascochyta pisi Lib.)** чистые линии сорта Гороха "Виктория Гейне" [Pure lines of the Pea variety 'Victoria Heine' resistant to *Ascochyta pisi* Lib.].—*C. R. Pan-Sov. V. I. Lenin Acad. agric. Sci., Moscow*, vi, 3, pp. 11–12, 1941.

In preliminary trials conducted during 1938 in the Voronezh district of the U.S.S.R., 500 pure lines of the pea variety Victoria Heine were tested for resistance to *Ascochyta pisi* [*R.A.M.*, xx, p. 440] and four highly resistant and two medium resistant ones were reserved for further trials. After the failure of the 1939 tests owing to drought, seeds of these six lines were sown again in 1940 in artificially infested soil in the field. The degree of infection was estimated according to a scale ranging from 0 for a healthy plant, to 3 for plants showing over 50 per cent. of their entire surface (leaves and stems) diseased. On this basis the 1940 results showed that all the six pure lines were far more resistant than the standard Victoria Heine, which received marks of 1·87 and 2·15 for the vegetative parts and fruits, respectively, whereas the corresponding marks for line 405 were only 0·05 and 0·005; for line 53 only 0·17 and 0·02; and none of the remaining lines 61 (originally placed in the medium resistant group), 161, 363 [? and a sixth line] had higher marks than 0·95 and 0·52, respectively. It is pointed out that individual plants within a resistant line are sometimes less resistant than the rest, indicating the necessity of repeated selection of particularly resistant plants. The selected resistant lines did not significantly differ from each other or from the standard Victoria Heine in their morphological and biological characters, and are considered to promise high yields.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, liii, 7, pp. 331–334, 5 figs., 1942.

Onion downy mildew (*Peronospora destructor*) [*P. schleideniana*: *R.A.M.*, xix, p. 324; xx, p. 442] occurs every spring in the coastal areas of New South Wales, frequently causing considerable reduction of yield. In wet seasons, the disease is also important in the inland parts of the State. Attack is generally followed by leaf mould due to *Macrosporium parasiticum* [*Pleospora herbarum*: ibid., xiii, p. 614]. This fungus appears to be unable to effect an entry into onion leaves unless they have already been weakened by some other agency. Sources of downy mildew infection of a young onion crop include diseased leaves left in the field from the previous crop, which carry resting spores capable of infecting the new crop, diseased bulbs used for seed, which produce an abundance of spores on the first-formed leaves, and diseased or contaminated seed (i.e., carrying the fungus within the seed coat, or as an external contaminant). The disease may be kept in check by crop sanitation and rotation, air and soil drainage, good cultural practices, and seed treatment. With regard to the first of these, all dead tops, discarded bulbs, etc., should be collected and burned after the onions have been harvested; onions should be grown on the same land only once every three or four years; bulbs for seed should be taken from healthy plants, and the seed plot should be as remote as possible from the bulb crop. If there is any doubt about the healthiness of the seed, it should be steeped (tied loosely in a cheese-cloth $\frac{1}{4}$ lb. at a time) in water kept at 122° F. for 25 minutes.

Onion smut (*Urocystis cepulae*) [ibid., xx, pp. 442, 443] has not yet become established in New South Wales, but it has been detected on onions imported from New Zealand [loc. cit.]. It is thought that the disease was introduced into New Zealand with onions imported for culinary purposes, some of which were used for seed

production, and it is emphasized that on no account must onion bulbs imported into New South Wales be used for seed purposes.

Smith (J. B.) & Howard (F. L.). **Response of Cos or Romaine Lettuce to chloropicrin soil treatment, phosphate, and lime.**—*Proc. Amer. Soc. hort. Sci.*, xl, pp. 552–556, 1 graph, 1942.

In pot experiments conducted from 1939 to 1941, Cos or Romaine lettuce plants were grown in soils taken from the Rhode Island Experiment Station Farm where they had previously been cropped for over 40 years, to which various fertilizers and chloropicrin [*R.A.M.*, xxi, p. 423] were added. The results indicate that field soil of this type fails to produce a good crop of lettuce owing, it is suggested, to the presence of injurious and competitive micro-organisms in the soil. Chloropicrin, injected into the soil at the rate of 5 c.c. per cu. ft., was found to increase the yields by eliminating these organisms, particularly when used together with phosphate applied as monocalcium phosphate up to an equivalent of 12,000 lb. 20 per cent. superphosphate per acre, and when the soil acidity was adjusted by liming to above P_H 6·0.

Agricultural research.—*Rep. E. Afr. agric. Res. Sta., 1941*, p. 3, 1942.

In experiments carried out by the Plant Pathologist [Dr. H. H. Storey] the brown streak virus of cassava [*R.A.M.*, xxi, p. 241] was shown to be transmissible by the white fly [*Bemisia* sp.] responsible for the conveyance of mosaic from infected to healthy plants. As in previous years, the incidence of both diseases was very high in the Kizugu trial plots, but a number of clones were free from one or both, a cassava × cassava cross of the 1937 series, for instance, remaining entirely free from mosaic in this second test.

Maier (W.) & Mittmann-Maier (Gertrud). **Untersuchungen über den Wuchsstoffgehalt gesunder und reisigkranker Reben.** [Studies on the auxin content of healthy and reisig-diseased Vines.]—*Wein u. Rebe*, xxiv, pp. 109–124, 1942. [Abs. in *Chem. Zbl.*, cxiii (ii), 11, p. 1251, 1942.]

At the Geisenheim (Rhine) Viticultural and Horticultural Research Station the shoot tips of healthy vines were shown by means of the *Avena* test to contain about three times as much auxin as those affected by 'reisigkrankheit' [court-noué : *R.A.M.*, xviii, p. 652], larger amounts being present in the younger and more vigorous shoots of the sound plants than in the older and weaker ones. In general, the auxin content of sharply downward bending shoots was relatively high. It is still uncertain whether the affected vines actually produce less auxin or whether the growth substance is partially destroyed by the virus.

Snyder (E.) & Harmon (F. N.). **Some effects of zinc sulphate on the Alexandria Grape.**—*Proc. Amer. Soc. hort. Sci.*, xl, pp. 325–327, 1 fig., 1942.

The fruit yields of vigorous six-year-old grafted Muscat of Alexandria vines, which had been producing very loose clusters but showed no foliar symptoms of little leaf (or zinc deficiency) [*R.A.M.*, xiv, p. 768], were practically doubled in trials in California during 1938 to 1941, when a solution of 2 lb. zinc sulphate in 1 gal. water was brushed on the pruning cuts within an hour after pruning. This increase in yield occurred in spite of the fact that some injury was caused to dormant buds on the spurs, and was apparently due to a better setting of berries. The vine growth, estimated by the pruned wood weights at the end of the season, was not influenced by the treatment. It is concluded that the poor setting in the vines under investigation might be associated with zinc deficiency.

Williams (P. H.) & Selman (I. W.). **Plant diseases.**—*Rep. exp. Res. Sta. Cheshunt, 1941*, pp. 45–52, 1942.

In this report [cf. *R.A.M.*, xx, p. 446] P. H. Williams states that on 17th February, 1941, seeds received from California of the American tomato variety Riverside and of unnamed selections from crosses between this variety and others (all resistant to *Verticillium albo-atrum* and *Fusarium bulbigenum* var. *lycopersici*) were sown at Cheshunt, together with seed of the English varieties Ailsa Craig and Potentate (susceptible to both diseases) and Manx Marvel (reputedly resistant). The plants were potted, and inoculated with each fungus under the ball in direct contact with the roots. By 21st October, *V. albo-atrum* had been recovered from all the inoculated plants except one. Two of the unnamed selections, 40004-11 and 40005-17, were significantly more resistant to this fungus than American Riverside, Ailsa Craig, Potentate, or Manx Marvel. American Riverside appeared to be the most susceptible variety, followed closely by Ailsa Craig. Manx Marvel was more resistant than Ailsa Craig, but not significantly so. No conclusions could be drawn with regard to *F. bulbigenum* var. *lycopersici*.

In an experiment made by I. W. Selman to study the effect of varying amounts of lime and potash on tomato plants inoculated with spotted wilt [ibid., xx, p. 430], 60 seedlings were potted in a medium clay loam deficient in soluble potash and containing no free lime (P_H 5·5 to 5·7). Dried blood and superphosphate were added; lime was applied at the rate of 0, 0·2, 0·6, and 1·8 gm. per pot, and for each level of lime sulphate of potash was applied at 0, 0·1, 0·3, 0·9, and 2·7 gm. per pot. Each treatment was applied to three plants. At the seventh leaf stage, all the seedlings were inoculated by wiping every leaf with muslin soaked in infective juice. Twenty-one days after inoculation spotted wilt symptoms were present on all the 15 plants that received no lime, on all those given 0·2 gm. lime, on 13 given 0·6 gm., and on 12 only of those receiving 1·8 gm. The symptoms varied with the amount of lime. In the series with no lime, leaf-reflexing was well defined, secondary black, chocolate, or light-brown spots or a chocolate glaze appeared, and the leaves tended to roll up, displaying the under sides of the veins, which were purple. With 0·2 gm. lime, leaf-reflexing was general, light brown or chocolate spots appeared, but no black ones, or the leaves showed a general bronzed glaze, or a few plants showed local, necrotic, primary lesions only, and some plants developed leaf roll symptoms. With 0·6 gm. lime, leaf-reflexing was present, severe lesions developed (yellow, black, or brown spots, or zonate, brown spots, or coalescing brown patches, some of which killed the leaf), only one plant developed glazed bronzing, and the tendency to leaf roll was at a minimum, only three plants showing this symptom. With 1·8 gm. lime, leaf-reflexing was slight, few spots were produced, but these often killed individual leaves, bronzing was seldom apparent, and only ten plants showed leaf rolling, which was very slight. There was very little evidence of change in the length of the incubation period under different potash levels, and no consistent differences in the symptoms displayed. It was observed, however, that the plants given no lime and 0·3 gm. sulphate of potash developed spotted wilt symptoms most readily.

Stem stripes or streaks in tomato plants are now known to be associated directly or indirectly with the following factors: (1) the viruses of mosaic, enation mosaic, tobacco mosaic, aucuba mosaic, and spotted wilt, and mixed potato and tomato viruses, in combination with temporary water shortage in porous, well-fertilized soils, mineral deficiency, especially potash shortage, unbalanced fertilizers, or high temperatures with low light intensities; (2) infection with *Bacillus* [*Erwinia*] *lathyri*; (3) water shortage alone under the conditions mentioned above, potash deficiency alone, and toxic chemicals. By far the commonest cause of streak, however, is tomato mosaic plus faulty cultural methods.

A two years' study of the growth and fruiting of Potentate tomatoes infected

with tomato mosaic when the first and the fifth trusses were in bloom [ibid., xx, pp. 447, 607] showed that early infection consistently produced a significant reduction in the numbers of fruits, a non-significant reduction in average fruit weight, a significant reduction in the total yield of ripe fruit, and an increase in the percentage (by weight) of blotchy fruit. The results in 1941 differed from those obtained in 1940 in that in 1941 early infection did not reduce the number of flower buds formed or the number of leaves produced, and did not significantly affect the growth rate of the stem. The difference between these results is attributed to the fact that in 1941 nitrogen supply, atmospheric humidity, and soil moisture were all greater than in 1940. The importance of the partial failure of the flowers to set fruit in the early infected plants in relation to final yield was shown in the close correlation between the yield of the individual trusses and the numbers of fruits maturing on each truss. The evidence suggests that the effect on fruit set of virus infection is more severe when infection occurs in early spring than when it takes place about midsummer. The relative reduction in fruit yield caused by early infection fell from 22·3 per cent. in 1940 to 13·4 per cent. in 1941. Also, the absolute yields per plant were higher in both early and late infected plants in the second year, indicating that better cultural conditions will reduce losses due to early attack by tomato mosaic.

Conners (I. L.). **Twenty-first Annual Report of the Canadian Plant Disease Survey, 1941.**—xviii+102 pp., 1942. [Mimeographed.]

In this report [cf. *R.A.M.*, xxi, p. 121], the author states that during 1940 wheat stem rust (*Puccinia graminis*) caused little damage in western Canada. In the important 'rust area' in Manitoba and eastern Saskatchewan, rust-resistant varieties have almost completely replaced susceptible bread wheats, and there was scarcely any rust on any variety. In late fields, beyond the rust area, stem-rust damage was moderate to severe in Saskatchewan and slight to moderate in southern Alberta. Infection was more prevalent than usual near Lethybridge and in the vicinity of the Peace river. In eastern Canada, infection was moderate to severe in only an occasional field.

The average loss in yield due to common root rot of wheat (*Helminthosporium sativum* and *Fusarium* spp.) was estimated at 12·1 per cent., as against 16·6 per cent. in 1940 [loc. cit.].

Wheat kernel smudge [loc. cit.] was less prevalent in the Prairie Provinces than in 1940. *Alternaria* spp. and *H. sativum* were the fungi most commonly associated with the condition, the latter appearing to cause the more severe forms of it.

F. graminearum [*Gibberella zeae*] was isolated for the first time from blighted wheat heads in Manitoba in 1941 [cf. ibid., xx, p. 101], having been found only twice before in seed wheat.

Lucerne bacterial wilt (*Phytomonas insidiosa*) [*Corynebacterium insidiosum*: ibid., xx, p. 102] continued to be destructive in the irrigated areas of southern Alberta, and occurred in several new localities in the dry interior of British Columbia.

Potato bacterial ring rot (*Phytomonas sepedonica*) [*Corynebacterium sepedonicum*: ibid., xxi, p. 390] became more prevalent in the irrigated parts of southern Alberta, being present on 102 farms, as against 89 in 1940, and 40 in 1939. It was found in new localities in Saskatchewan, Manitoba, Ontario, and Quebec, particularly in table stock. More fields were rejected because of the disease in Quebec and New Brunswick in 1941 than in 1940. In Prince Edward Island, however, where certified seed production is a very important industry, only one case was found, as against 25 in 1940. Late blight (*Phytophthora infestans*) of potatoes was prevalent in the coastal areas of British Columbia, and was reported for the first time from the interior. After an interval of 13 years it again appeared in Manitoba [ibid., vii, p. 558], and caused considerable damage in the Red River Valley. It was also destructive in northern Ontario, north-western Quebec, New Brunswick, and Prince Edward Island, the

epidemic in the last-named locality being perhaps the heaviest ever experienced. Potatoes infected by *Synchytrium endobioticum* were found in a small garden near Halifax, Nova Scotia, which had been under cultivation for 60 years. The garden was at once cleaned up, and the affected material destroyed. All clues as to the source of infection were investigated, but to no purpose, and arrangements were made for a further search the following summer. The owner agreed to refrain from growing potatoes on the plot until permitted to do so by the Department of Agriculture. Meantime, the garden is to be visited at regular intervals, and all steps are being taken to prevent spread and find any other centres of infection that may be present.

Tomato bacterial speck (*Phytomonas* [*Bacterium*] *tomato*) [ibid., xii, p. 555] was observed for the first time in 1940 in Manitoba, where, in one instance, it caused heavy losses. *P.* [*Xanthomonas*] *vesicatoria* [ibid., xxi, p. 341], previously known in Ontario and Quebec, was reported from Manitoba and Nova Scotia.

Erwinia amylovora was reported for the first time in Alberta on apple. The disease now occurs in every province in Canada, but has never been of any importance in the Annapolis Valley, Nova Scotia [ibid., xviii, p. 725]; it remains a problem in Ontario and Quebec, where it caused a moderate epidemic in 1941.

Records of the virus diseases of stone fruits included X disease of peach and chokecherry [ibid., xxi, p. 259] in Ontario, western X disease of peach [see below, p. 32] in British Columbia, prune mosaic [cf. ibid., xix, p. 417; xx, p. 371] on prune and peach in Ontario and British Columbia, line-pattern mosaic in Shiro plums in Ontario [ibid., xxi, p. 146], and cherry mottle leaf and little cherry (? virus) in British Columbia.

D. J. MacLeod is stated to have proved experimentally that yellows of buckwheat, carrot, China aster, phlox, and the weed *Hieracium floribundum* is caused by *Callistephus* virus 1 [aster yellows virus]. This virus was found on lettuce in Manitoba and Quebec, on *Helichrysum* in New Brunswick, on snapdragon [*Antirrhinum*] in Prince Edward Island, and on *Calendula* in New Brunswick and Prince Edward Island.

New records include *Phyllosticta pteridis* on greenhouse ferns, *Ramularia macrospora* on Canterbury bells [*Campanula* sp.], *Cladosporium cyclaminis* on cyclamen, *Ascochyta aquilegiae* on larkspur [*Delphinium* sp.], *Sphaerotheca humuli* on meadowsweet [*Spiraea* sp.], *Phytomonas* [*Xanthomonas*] *hederae* on English ivy, and *P.* [*Bact.*] *tardicrescens* on iris [ibid., xviii, p. 31].

WILLIAMS (R. O.). **Trinidad and Tobago. Administration Report of the Director of Agriculture for the year 1941.**—14 pp., 1942.

This report [cf. *R.A.M.*, xxi, p. 281] contains on pp. 11–12 the following items of phytopathological interest. A field test on the control of witches' broom of cacao (*Marasmius perniciosus*) is in progress, in which the brooms are being thoroughly cut in June–July and October–November; monthly counts are made of the brooms on a large number of marked trees in blocks where brooms have been cut, and in surrounding areas in which no attempt at control is made.

Dr. F. J. Pound reports (on p. 10) that the incidence of witches' broom on 2,500 trees, mostly imported from Ecuador, was as follows: a small percentage showed no infection, a large percentage had a very small number of infections, and a small percentage were heavily infected. Material imported from the Amazon grew less rapidly than that from Ecuador, but exhibited a similar range of disease incidence.

Trial plots of I.C. 2 bananas at Tamana and Grande Riviere were severely attacked by 'moko' disease [*Bacterium solanacearum*].

WIEHE (P. O.). **Division of Plant Pathology.**—*Rep. Dep. Agric. Mauritius, 1941*, pp. 11–13, 1942.

In this report [cf. *R.A.M.*, xxi, p. 125] on plant disease work in Mauritius in 1941,

it is stated that red rot [*Colletotrichum falcatum*] was more prevalent than before on M. 134/32 sugar-cane in certain localities, but the percentage infection was low, indicating commercial resistance. A positive correlation was found to exist between date of planting and frequency of infection, and it is recommended that M. 134/32 should be planted during the period May–August in order to escape infection. The M. 168/32 variety was severely affected.

When *C. falcatum* was grown on a peptone-saccharose medium containing 0·01 to 0·04 per cent. gallic acid, tannic acid, resorcinol, or tyrosin, tannic acid and resorcinol markedly reduced growth at concentrations over 0·02 per cent. Gallic acid and tyrosin had no significant effect. Phenolic compounds isolated from cane stems had no adverse effect on growth.

Tobacco black shank (*Phytophthora parasitica* var. *nicotianae*) was more prevalent than during the previous year, probably as a result of high temperatures in June, July, and August.

Satisfactory control of 'herbe tourterelle' (*Wickstroemia indica*) by experimental infection with *P. parasitica* was obtained [ibid., xx, p. 291], but further experiments will be necessary before large-scale inoculations can be attempted.

Maize varieties newly introduced from South Africa, and growing in experimental fields in two localities, were attacked by a rapid soft rot of the stem tissues near the base, causing the stalks to topple over. Hickory King was the variety most severely affected. A bacterium isolated from diseased material closely resembled *Bacterium dissolvens*, not previously recorded on the island. Preliminary tests indicate that the local variety of flint maize is more resistant than the introduced maize varieties.

New records for the year included maize smut (? *Sphacelotheca reiliana*).

Plant diseases. Notes contributed by the Biological Branch. —*Agric. Gaz. N.S.W.*, liii, 6, pp. 281–285; 8, pp. 380–387, 21 figs., 1 diag., 1942.

Full directions are given for the treatment of vegetable seeds with (*a*) copper carbonate, copper oxychloride, red cuprous oxide, and the organic mercury dusts, ceresan and agrosan, preparations of the former group generally being applied at the rate of one level teaspoonful per lb. of seed and those of the latter at ¼ to ½ this dosage (suitable for beet, carrot, cucurbits, peas, spinach, and tomato); (*b*) immersion in a fungicidal solution, e.g., ten minutes in acidulated mercuric chloride (4 oz. in 1 qt. hydrochloric acid per 25 gals. water) for potato tubers, 5 minutes in mercuric chloride (¼ oz. in 12½ pts. water) for tomato seed, and 24 hours in 0·6 per cent. acetic acid or four days' fermentation soak, for tomato against canker [*Corynebacterium michiganense*: *R.A.M.*, xvii, p. 79]; and (*c*) steep in hot water (50° C.), 25 minutes for cabbage and onion, 18 for other crucifers, and 10 for celery at 57°.

An exceptionally severe outbreak of orange melanose [*Diaporthe citri*] in 1942, causing heavy damage ('tear staining') on Washington Navels, and moderate injury on Valencias, is tentatively attributed to the extreme drought prevailing throughout the summer, broken in March by torrential rains, which afforded favourable conditions for infection of the shrivelled leaves.

In the second contribution, brief notes are given on the symptoms and control of tomato diseases in New South Wales.

Boughey (A. S.). **List of economic plant diseases in the Anglo-Egyptian Sudan. Their appearance, distribution, and control. Including weeds and ornamentals which may serve as alternative hosts for crop diseases.**—44 pp., Dep. Agric. For. Sudan Govt., 1942.

Among the diseases of major importance included in this useful list of economic crop pathogens in the Anglo-Egyptian Sudan may be mentioned broad bean wilt (*Fusarium moniliforme*) [*Gibberella fujikuroi*], coffee rust (*Hemileia vastatrix*), groundnut rosette, potato early and late blights (*Alternaria solani* and *Phytophthora infestans*)

and tuber rot (*Stysanus stemonites*) [*R.A.M.*, xv, pp. 673, 824], and tomato spotted wilt. The presence or absence of a given disease from a particular district is expressed by means of ordinary and Roman numerals, respectively, and a list is given of some common Sudan Arabic names of the hosts with their English or Latin equivalents.

Milbrath (D. G.). **Bureau of Plant Pathology.** Ex *Rep. Dep. Agric. Calif., 1941* (*Bull. Dep. Agric. Calif.*, xxx, 4), pp. 374–384, 1941.

In this report [cf. *R.A.M.*, xxi, p. 4] it is stated that *Dematophora* [*Rosellinia*] *necatrix* was found in a small area under lucerne in the vicinity of Banning, Riverside County, California [ibid., xxi, p. 23], a first record for the southern part of the State. The infected area was treated with carbon bisulphide at the rate of 4 oz. per 18 in. interval (750 gals. per acre).

The three chestnut plantings infected with *Endothia parasitica* [ibid., xxi, p. 310] were given the two usual annual inspections. A conspicuous decline in the number of affected trees was observed in the two plantings in which treatment has been carried out for seven years, only two and three diseased trees, respectively, being found; in the third planting, where treatment has been given over a shorter period, 14 infected trees were found. Eventually the disease will probably disappear from these plantings. Locally spread is slow, and the perithecial stage has not been found.

The control of western celery mosaic [ibid., xxi, p. 4] by an enforced celery-free period was continued in three separate localities. The principle of the method is based upon the fact that celery plants are the principal source of infection. The carrot is the only other known host that develops the disease in the field, and this crop is grown only very sparsely in the areas concerned, and is harvested in its entirety, no residue of active roots remaining in the ground. With celery, a harvest residue is left in the soil, and there is a rapid succession of crops. Control involves the removal of all vestiges of actively living parts of celery from all fields within the area at a definite time (e.g., 10th August to 10th September under field conditions at Venice). The results have been most outstanding, and have gained the support of the growers for this method.

Operations against peach mosaic [loc. cit.] were continued in co-operation with the Bureau of Entomology and Plant Quarantine. During the year, 653,045 trees on 55,221 properties were inspected, and 3,902 infected ones removed. On 31st December, 1941, 446 old and new cases of infected trees remained standing, and of these 131 were removed in January, 1942, by the owner.

In California, the most destructive vine disease is Pierce's disease [ibid., xxi, p. 278], because of its fatal effect, rapid spread, and widespread distribution. An organized survey by twelve inspectors for 34 man-months showed the condition to be present in 29 of 45 counties surveyed. The highest percentage of infected properties (77·2 per cent.) occurred in Tulare County, which had the second largest area under grapes (65,512 acres). The evidence obtained showed that spread has been very swift in the southern part of the San Joaquin Valley, but less rapid in certain northern counties, such as Rapa. This difference is attributed to epidemiological factors, which will be of first importance when control measures come to be formulated.

Lucerne bacterial wilt (*Phytomonas insidiosa*) [*Corynebacterium insidiosum*] and dwarf [ibid., xxi, p. 278] are both outstanding diseases locally; the former is rather widely distributed in the United States, whereas the latter seems to occur only in California. An organized survey of lucerne dwarf distribution is planned.

White (P. R.) & Braun (A. C.). **A cancerous neoplasm of plants. Autonomous bacteria free crown gall tissue.**—*Cancer Res.*, ii, 9, pp. 587–617, 13 figs., 1942.

Secondary or metastatic tumours frequently arise on sunflower plants inoculated with *Phytomonas* [*Bacterium*] *tumefaciens* at considerable distances from the original

neoplasms, the former having been shown by cultural and serological methods to be bacteria-free [*R.A.M.*, x, p. 198]. Tissue cultures isolated from the metastatic tumours on a synthetic agar medium (*Biol. Rev.*, xvi, pp. 34-48, 1941) containing sucrose showed a rapid, disorganized type of growth contrasting sharply with the slow, moderately organized development of those from healthy material. On implantation into uninfected plants of the same or related species (*Helianthus tuberosus*) the bacteria-free tissues induced typical crown-gall tumours. This capacity for unrestrained, invasive, potentially malignant growth, both *in vivo* and *in vitro*, in the absence of the original excitant distinguishes the sunflower metastases from any other plant materials hitherto described and places them in a category comparable to that of cancerous growths in animals.

Florey (H. W.) & Jennings (M. A.). **Some biological properties of highly purified penicillin.** —*Brit. J. exp. Path.*, xxiii, 3, pp. 120-123, 1942.

The purest preparation of penicillin [*R.A.M.*, xxi, p. 344 and cf. next abstracts] at present available completely inhibits the growth of *Staphylococcus aureus* at a dilution of 1 in 24,000,000 to 1 in 30,000,000. An intravenous injection of 20 mg. of the sodium salt of a rather less highly purified preparation is without apparent effect on a mouse, and human leucocytes survived for an hour in a 1 per cent. solution.

Wilkins (W. H.) & Harris (G. C. M.). **Investigation into the production of bacteriostatic substances by fungi. I. Preliminary examination of 100 fungal species.** *Brit. J. exp. Path.*, xxiii, 4, pp. 166–169, 1942.

The following fungi excited a significantly inhibitory effect on the growth of one or more of the three bacteria, *Bacterium coli*, *Staphylococcus aureus*, and *Pseudomonas pyocyanea*, against which they were tested in a preliminary series of experiments at the University Department of Botany, Oxford: 9 species of *Penicillium*, 16 of *Aspergillus*, *Botrytis cinerea*, *Helminthosporium avenae*, and *Fusarium javanicum*.

Waters (H. B.). **Report on the Department of Agriculture, Gold Coast, for the year 1941–42.**—7 pp., 1942.

In this report [cf. *R.A.M.*, xx, p. 517] it is stated that during the period under review further surveys showed cacao swollen shoot [ibid., xxi, p. 409], to be present in the Gold Coast in several places west of the Atewa Range, which it had been hoped might form a barrier to the spread of the disease from the east. It was also found on many farms to the east of the large outbreaks at Awenade. Many farms are infected in the Peki area, and several outbreaks have occurred near Wiawso. A large outbreak was found at Kobriso, near the Central Province. The disease has not yet, however, been recorded from Ashanti, the Central Province, or the main Togoland cacao area. To make a complete survey of the disease, all the cacao areas would have to be patrolled, a task which it is estimated would require the services of 20 inspectors and 160 assistant inspectors (who would have to be trained) for a year. In recent surveys, the most expeditious patrolling by one inspector and seven assistant inspectors was 2,000 acres in one week. Even on the scale suggested, patrolling would be unavailing unless treatment patrols, probably consisting of an equal number of men, followed on, cutting out diseased areas. The surveys already made are considered to have served their purpose, by ascertaining what the situation was, and deciding whether treatment could be applied in time to the localities concerned. Isolated outbreaks were treated at Kwabeng, Kwahu, and Awenade, and as the disease is already too firmly established eastwards of Awenade, efforts are being concentrated on preventing spread towards Ashanti and the Central Province.

Surveys of two separate square miles near Mankese and Akodum in the main area of infection revealed that almost 60 per cent. of the cacao farms had died, and over 90 per cent. of the standing old cacao was infected; young standing cacao amounted

to 5 per cent. of the cacao area, and seedling cacao to 1 per cent. Despite this destruction of farms, cacao production is maintained from new plantings in their areas. Spread of infection has been comparatively slow, but the disease is now so prevalent in the main infection area that treatment would be practicable there only if growers would themselves cut out the diseased trees and at least one ring of apparently healthy trees surrounding them. To this they do not appear likely to agree.

The Swollen Shoot Disease of Cocoa Order, 1941 [ibid., xxi, p. 544], provides for the removal of cacao trees from a small strip of land joining North Fomangsu and South Fomangsu Forest Reserve in order to complete a barrier against spread from the Eastern Province to Ashanti.

Săvulescu (T.), Hulea (Mme A.), & Stănescu (Mlle A.). **Das Vorkommen und die Verbreitung der in Rumänien den Weizenstinkbrand hervorbringenden Tilletia Arten.** [The occurrence and distribution of the *Tilletia* species causing Wheat bunt in Rumania.]—*Phytopath. Z.*, xiv, 2, pp. 148–187, 5 figs., 1 graph, 1 map, 1942.

Wheat bunt in Rumania is caused by four species of *Tilletia*, namely, *T. foetens* [*T. foetida*], *T. tritici* [*T. caries*], *T. triticoides* Săvul. (= 'Typus *triticoides* Gassner'), and *T. intermedia* Gassner (forma '*intermedia*' Gassner = *T. foetida* × *T. caries*) [*R.A.M.*, xvii, pp. 382, 655; xviii, p. 303], of which the first-named predominates, followed by *T. triticoides*, *T. caries*, and *T. intermedia* in the order given. *T. foetida* is particularly widespread in the south and east, where climatic conditions approximate to those of the steppes, while *T. caries* is largely confined to the north and west and to hilly districts, its presence in the Danube Valley, e.g., near Bucarest, being explained by the introduction of wheat selections from the north and west of Europe. The exact geographical distribution of all four species is shown in tabular form and its implications summarized.

T. triticoides, formerly regarded as a type of *T. caries*, is now deemed to merit specific rank [though no technical diagnosis is supplied]. Its spores resemble those of *T. caries* in shape, being spherical or subspherical, but are smaller, the means (for 100 spores) ranging from 16·63 to 18·13 by 15·55 to 17·19 μ. The number and size of the membrane reticulations are similar in both species, but the network is more delicate in *T. triticoides* and the margin slightly undulating. *T. triticoides* is found in association with *T. foetida*, frequently even in the same ears of the plant, though on different seeds; it was not observed to accompany *T. caries*, which in fact it largely replaces in the south of the country. The ears of seven varieties inoculated with *T. triticoides* were found to harbour this species alone, so that there can be no further question as to its homozygotic nature, which is also demonstrated by its morphological and biometrical constancy. The pathogenicity of *T. triticoides* is intermediate between that of the very virulent *T. foetida* and that of *T. caries*, the A. 26 variety being the most susceptible to the first-named (average infection with collections from five provinces 41·3 per cent.) closely followed by Cenad 117 (37·4), and Tigănesti 902 the most resistant (12·7), the reactions of Zemka, Bankut 1201, Odvos 241, and Cooperatorka falling between these limits.

T. intermedia always occurs in the company of either *T. foetida* or *T. caries*; so far it has only been collected in four districts. The spores have a mean size of 16·96 to 17·14 by 15·55 to 16·06 μ and the reticulations are very fine. In the opinion of the author, *T. triticoides* is more likely to be one of the parents of this hybrid than *T. caries*, but his hypothesis needs further substantiation.

Ledingham (R. J.). **Observations on antagonism in inoculation tests of Wheat with Helminthosporium sativum P.K. & B., and Fusarium culmorum (W.G.Sm.). Sacc.**—*Sci. Agric.*, xxii, 11, pp. 688–697, 1942.

In 1940, in field tests at Saskatoon and Indian Head, Saskatchewan, Thatcher

wheat was inoculated with *Helminthosporium sativum* and *Fusarium culmorum*, singly and in combination, using the spore-suspension and oat-hull methods. The results demonstrated that emergence was better when both fungi were combined than when they were used singly. In both localities, this difference was highly significant. The increased emergence (presumably due to antagonistic action between the fungi) was greater when oat-hull inoculation was used than when the spore-suspension method was applied. These results agreed entirely with those obtained in preliminary greenhouse tests.

Growth tests on potato dextrose agar showed that *H. sativum* is quite sensitive to other colonies, either of itself or of *F. culmorum*, though the latter is not inhibited to the same extent. Germination tests were also made, in which conidial suspensions of the two fungi were made up, singly and in combination, and transferred to a slide, so that *F. culmorum* alone, *H. sativum* alone, and the two mixed together were present on each slide. The slides were incubated and counts made of percentage germination. In general, *H. sativum* germinated well alone, as did *F. culmorum*, but when they were combined, the conidia of the latter germinated as well as when alone, while those of *H. sativum* germinated at a greatly reduced rate.

Johnson (T.) & Hagborg (W. A. F.). **Brown necrosis and Alternaria blotch of Wheat.**—*Sci. Agric.*, xxii, 12, pp. 746-760, 1 fig., 1942.

Wheat heads in field plots at Winnipeg have for some years shown a dark discoloration, usually most conspicuous on the outer glumes and lemmas, but also present on the rachides, the internodes (below each node), and, occasionally, the upper part of the peduncle. On the outer glumes, the condition resembles bacterial black chaff, but *Xanthomonas translucens* var. *undulosa* [*R.A.M.*, xxi, p. 447] has not been isolated from affected material. The discoloration on the outer glumes, rachides, peduncles, and internodes was attributed by McFadden to stem rust (*Puccinia graminis tritici*) [ibid., xviii, p. 662]. On the lemmas the condition is associated with *Alternaria tenuis*.

Experimental evidence was obtained which suggested that stem rust may cause discoloration of wheat glumes and the terminal regions of the lemmas while the plant tissues are young and succulent, but that the ability to cause discoloration becomes less as the tissues mature.

Greenhouse tests demonstrated that *A. tenuis* is able to cause melanistic lesions on the lemmas when the conditions approximate to those obtaining in the field. Field experiments clearly showed that *A. tenuis* has considerable ability to discolour the lemmas of wheat varieties derived from Hope or H 44. Its ability to discolour the outer glumes was found to be less marked. Only occasionally was it able to cause discoloration of any other parts. The name *Alternaria* blotch is suggested for the symptom caused by *A. tenuis*.

Under field conditions, floret sterility was produced experimentally by *A. tenuis* in one of three years; sterility due to *P. graminis* resulted only from inoculation by Moore's method [ibid., xv, p. 567]. Greenhouse experiments showed that injured ovaries may serve as infection courts for *A. tenuis*, as may injured areas on lemmas or glumes. The main course of infection, however, is from spores that gain entrance to the inside of the florets, where the presence of dead floral parts favours mycelial growth.

Histological examination of glumes of Renown wheat discoloured by stem rust showed the formation of appressoria and the penetration of entrance hyphae through stomata, but there was seldom any mycelium beyond the substomatal cavity. In the discoloured areas, the cell contents of the parenchyma underlying the stomata on the outer side of the glume were yellow or brown and often much shrivelled. Apparently, the parenchyma tissue is hypersensitive to *P. graminis*; the penetration of the entrance hyphae into the tissue sets up a necrosis (the 'brown necrosis' of

McFadden) distinguished by its brown colour and a tendency to spread for considerable distances along the narrow strips of parenchyma between the vascular bundles.

Examination of Apex and Renown wheat lemmas discoloured by *A. tenuis* invariably showed extensive mycelial growth along the inside surface of the lemma, originating on dead or dying parts. Discoloured areas on the lemmas coincided with the extension of the mycelial growth. In the browned tissue, the cell walls and contents showed dense yellow or brown pigment. In many cases, several layers of cells under the epidermis were collapsed, and so compressed that the lemma thickness was considerably reduced. Mycelium seldom penetrated into the epidermal cells or the underlying tissue. The absence or rarity of mycelium in the discoloured tissue suggests that the cells are killed as the result of the action of enzymes or toxins secreted by the fungus.

Gorlenko (M. V.). Патогенность различных рас **Bact. translucens var. undulosum** для Пшениц. [The pathogenicity of different races of *Bact. translucens* var. *undulosum* to Wheat.]—*C. R. Pan-Sov. V. I. Lenin Acad. agric. Sci., Moscow*, vi, 9, pp. 26–28, 1941.

The pathogenicity of the 13 races of *Bacterium translucens* var. *undulosum* [*Xanthomonas translucens* var. *undulosa*: see preceding abstract], isolated from wheat at the Bacteriological Laboratory of the Pan-Soviet Institute for Plant Protection, was tested in the open at Mitrofanovka, Voronezh district. When the inoculated seeds of wheat variety Cesium 0111 were sown in boxes, all but race 768 produced infection (ranging from 6·6 to 32 per cent.) within 12 days of sowing. The symptoms developing on infected plants included, in addition to those previously described [*R.A.M.*, xvi, p. 91], watery, light green, foliar lesions, which grew, coalesced, and reaching the leaf margin turned white, the leaves breaking off at that stage and their upper parts dying off.

Inoculation of mature plants of Ukrainka, Lutescens 1060/10, and Cesium 0111 with suspensions of nine races of the bacterium produced infection in all cases within 21 to 23 days, the average percentage of infection for the three varieties being 35·1, 56, and 43·3, respectively. In no case was complete blackening of the ears observed and it is concluded that the same picture would obtain following secondary infection in the field, the complete blackening being probably only characteristic of plants grown from infected seed.

Klikov (A. P.). Об источниках инфекции и о локализации возбудителя черного бактериоза злаков. [On the sources of infection and localization of the pathogen of black bacteriosis in cereals.]—*C. R. Pan-Sov. V. I. Lenin Acad. agric. Sci., Moscow*, vi, 1, pp. 15–19, 4 figs., 1941.

A study of black bacteriosis of wheat, caused by *Bacterium* [*Xanthomonas*] *translucens* [*R.A.M.*, xvii, p. 384], was conducted in the Voronezh district of the U.S.S.R. during 1938–9. Petri dishes with agar, after exposure for half an hour in a wheat field at ground-level or at a height of 0·25 m. above it yielded several strains of the organism, identified in microbiological and serological analyses. Dishes placed at 0·5 m. or more above ground remained sterile, probably due to the direct action of the sun rays. When water suspensions of these cultures were inoculated into wheat plants of the varieties Cesium 111, Duimchataya 034 (both susceptible) and Lutescens 062 (resistant), pure cultures of *X. translucens* could be isolated from the infected plants, indicating that the disease can be transmitted by air. The distribution of the causal bacteria in the mature plant tissues was studied in sections stained with safranin—aniline blue with picric acid. The maximum concentrations of bacteria were found inside and around the peripheral vascular bundles, smaller numbers occurring irregularly throughout the plant. It is assumed on the basis of these observations that the plant nutrients passing through the vascular bundles also serve as food for the bacteria; after the breaking down of the bundles by bacterial action,

the nutrients diffuse into the surrounding tissues and are followed by the bacteria. The absence of lignin from severely affected mechanical tissues, which usually turn black, is believed to be due to the action of an acid produced by the bacteria.

WILD (A. S.) & TEAKLE (L. J. H.). **Experiments with micro-elements for the growth of crops in Western Australia. V. Experiments at Kulin (Jilakin) and Bullaring in the southern Wheat belt, 1941.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xix, 2, pp. 71–78, 1942.

It is concluded from the results of further experiments in Western Australia [see below, p. 37] that copper sulphate, or some suitable substitute such as copper ore (mixed with superphosphate), applied to cereal crops at the rate of 5 lb. per acre, will correct copper deficiency in most soils of the wheat belt, 2½ lb. being sufficient for the very light sandy and gravelly types, and 10 lb. necessary for the very loamy and generally superior type of soil. Copper deficiency in wheat may be classified into four degrees of severity as follows: (*a*) very acute: characteristic symptoms appear from four to six weeks after germination, and either the whole plant dies, or only the older leaves, without forming heads; (*b*) acute: few symptoms appear on the leaves until spring (September), then leaf-tipping occurs, stem elongation is retarded, loose heads with pale, sterile florets are formed, and the leaf sheaths turn purplish-grey; (*c*) severe: plants appear normal until early November, but the grain does not mature, and erect dummy heads and discoloured leaf sheaths are general; and (*d*) moderate: the heads contain grain, but are less well filled and bend over on the stalk immediately below the head to a very much greater degree than normal. Experimental data indicate that, where copper deficiency is moderately acute, the weight of grain may be less than 30 per cent. of the net weight of straw and where acute, less than 20 per cent. (normally the ratio may be expected to be from 40 to 70 per cent.). Grain formed in copper-deficient plants is generally somewhat shrivelled and paler in colour than normal. Subterranean clover and lucerne appeared to be fairly reliable indicators of copper deficiency in the soil; oats and wheat, while less reliable, were also of some value.

SURYANARAYANA MURTY (G.). **Segregation and correlated inheritance of rust resistance and epidermal characters in a Barley cross.**—*Indian J. Genet. Pl. Breed.*, ii, 1, pp. 73–75, 1942.

At the Imperial Agricultural Research Institute, New Delhi, an investigation was conducted on the parents of a barley cross, namely, the American variety Alpha (*Hordeum distichon*) and Imperial Pusa 21 (*H. vulgare*), and the F_2 generation of the resultant progeny, the material being collected in the field at the Botanical Sub-Station, Pusa, during the winter of 1937-8. The Alpha parent was characterized by a large number of stomata and epidermal cells per unit area, small size of the stomata, and high resistance to rust (mainly *Puccinia glumarum*), while in the highly susceptible I.P. 21 the number of stomata and epidermal cells was smaller and the dimensions of the stomata larger. In the cross, resistance to rust was found to be inherited along definite Mendelian lines. The anatomical characters (number and size of the stomata and number of epidermal cells), though mutually correlated, were found to be inherited quite independently of rust resistance, plants with widely differing numbers of stomata of highly variable dimensions occurring in all four groups of reaction to the disease from mild to very severe [cf. *R.A.M.*, xi, p. 439; xv, p. 708].

ROSEN (H. R.), WEETMAN (L. M.), & MCCLELLAND (C. K.). **Winter injury as related to fall and winter growth and crown-rust infection in Oat varieties and their hybrids.**—*Bull. Ark. agric. Exp. Sta.* 418, 17 pp., 3 figs., 1 graph, 1942.

During the winter of 1939 to 1940, which was one of the coldest on record in Arkansas, about 6,000 selections of oat hybrids were growing at the main experiment

station, together with all the parent varieties used in hybridizing. Among these parents were some of the hardiest varieties, including Harry Culberson, Custis, Lee, Tennex, Fulwin, and Tennessee 1922, but the percentage of survival for all parents was very small, ranging from 28 for Tennex to 0 for some others. Of the selections, most were no hardier than the parents, and some even less so, but 38 showed 40 to 90 per cent. survival [cf. *R.A.M.*, xix, p. 11].

More than 5,000 selections of individual plants were made from the hybrids that survived the winter and possessed various desirable characters, including resistance to crown rust [*Puccinia coronata*]. Seeds from these were sown in September, 1940, and yields of over 5 tons per acre in green weight were obtained. The selections represented the F_5 and F_6 generations. Good growing weather was experienced, but a severe epidemic of crown rust developed. Every check row (Lee) was affected, infection varying from a trace to more than 50 per cent. On 11th November, the temperature fell to 24° F. and for most of the following six days it was below freezing, dropping as low as 9°. Many of the non-hardy selections and parents succumbed, while the hardier parents showed 35 to 70 per cent. leaf injury, some of it attributable to reduced hardiness due to severe crown rust. Many hardy selections developed appreciably less damage than the hardiest parents, among them being some that made much more growth for winter pasture than the hardy parents and are homozygous for resistance to crown rust, some to crown rust and stem rust [*P. graminis*] and to smuts [*Ustilago avenae* and *U. kolleri*]. The yield of grain of selected strains ranged from 122 to 300 gm. per 5 ft. row compared with 39 to 145 gm. for control rows of the Lee variety, which is considered at present one of the best for the region in question.

Săvulescu (Alice). **Contribuțiuni la studiul boalelor pe Sorghum.** [Contributions to the study of Sorghum diseases.]—*Anal. Inst. Cerc. agron. Român.*, xii, 33 pp., 1940. [Abs. in *Z. PflKrankh.*, lii, 7–8, p. 397, 1942.]

In 1931, 1932, and 1937 the foliage of various species of sorghum in Rumania was damaged by *Bacterium* [*Pseudomonas*] *holci* [*R.A.M.*, xviii, p. 517], which was isolated and successfully inoculated into *Sorghum exiguum*, *S. halepense*, and *S. vulgare*. In 1935, sorghum leaf sheaths bore the lesions of *Bact. sorghi* [ibid., xx, p. 494], which was also inoculated with positive results into the same host. Other factors, however, are believed to be concerned in the development of the latter disease, possibly including an aphid-transmissible virus, as in the case of red stripe in Italy.

Averna-Saccá (R.). **Pustulas pretas sobre Laranjas doces produsidas pelo Phoma citricarpa.** [Black spots on Sweet Oranges produced by *Phoma citricarpa*.]—*Rev. Agric., Piracicaba*, xv, 11–12, pp. 468–474, 3 figs. (1 col.), 1941.

The fungus isolated from the scattered, irregular, black pustules, 1 to 3 mm. in diameter, sometimes converging to form larger lesions (4 to 6 mm.) on sweet oranges purchased in the market of Piracicaba, São Paulo, in August, 1937, produced two kinds of mycelium in pure culture, one chromogenic and the other non-chromogenic, the former secreting a blood-red pigment which diffuses through the medium in cultures of 50 days old and upwards. Both types of mycelium are dimorphic and a distinctive feature of the chromogenic form is its connexion with groups of elongated, fusiform, hyaline, continuous or triseptate cells [resembling *Fusarium* conidia] united by slender, hyaline, terminal or median tubes. Pycnidial production, moreover, is delayed by two months in the chromogenic cultures and is relatively scanty. The pycnidia are globular, dark brown to nearly black, their interior occupied by cylindrical, slender, hyaline, sterigmata in close propinquity, and the pycnospores elliptical or ovoid, hyaline, 9·4 to 13·2 by 4·4 to 8·6 μ, with some individuals measuring 15·4 by 6·5 μ, which would justify the transference of the species from *Phoma* to *Macrophoma*. The pathogen is evidently identical with *P. citricarpa* [*R.A.M.*, xxi, p. 122],

both the Brazilian and Australian forms of which, unlike *P. aurantiiperda* in Italy [ibid., xv, p. 89], are confined to the exterior of the fruits and do not penetrate the underlying tissues. *P. citricarpa* was experimentally shown to be a wound parasite, insect punctures probably providing the normal channels of ingress.

Averna-Saccá (R.). **Sobre a forma ascofora (Glomerella sp.) que encontrei em algumas folhas de Laranjeira Doce no Guarujá.** [On the ascophorous form (*Glomerella* sp.) encountered on some Sweet Orange leaves in the Guarujá.]—*Rev. Agric., Piracicaba*, xv, 11–12, pp. 463–467, 3 figs. (1 col.), 1941.

Along the coast of São Paulo, Brazil, sweet oranges sustain considerable damage from anthracnose, caused by a species of *Glomerella* which appears to be distinct from *G. cingulata* and is characterized by a septate, branched mycelium, a dense, black stroma, hyaline, ellipsoid conidia (*Colletotrichum* stage distinct from *C. gloeosporioides*), 22 to 37·7 by 4 to 14·8 μ, pointed, 3- to 5-septate, black setae, 140 to 259 by 9·2 to 16·8 μ, developing between the cylindrical sterigmata, quasi-piriform, black perithecia, 148 to 296 by 166 to 296 μ, and clavate, short-stalked asci, 81·4 to 151·4 by 14·8 to 26 μ, containing eight navicular or allantoid, hyaline to light brown, uniseptate spores, 14·8 to 37 by 6·3 to 11 μ. The diseased leaves bear scattered, yellow or dark red-bordered lesions, which may unite to form broad, straw-coloured, brittle areas, sometimes occupying the entire lamina. The branches are similarly affected, while the fruits are covered with irregular, dark-coloured, sunken pustules or dark brown, leathery spots; in a humid atmosphere the entire surface blackens, shrivels, and roughens. Control measures should include the destruction of all infected material, protection against sea winds, liberal supplies of organic manure, phosphates, and lime, and spraying with 1 per cent. Bordeaux mixture as soon as the spots appear.

Loest (F. C.). **Diplodia and brown-rot gummosis of Citrus.**—*Fmg S. Afr.*, xvii, 197, pp. 517–520, 523, 4 figs., 1942.

In this preliminary account, the author states that for many years past growers in certain parts of the Eastern Transvaal and Eastern Cape Province have suffered heavy losses of citrus trees owing to gummosis due to *Diplodia natalensis* [*R.A.M.*, xxi, p. 128] and brown-rot gummosis caused by *Phytophthora citrophthora* [ibid., xx, p. 401; xxi, p. 195]. As far as is known, *D. natalensis* is confined to the Eastern Transvaal; *P. citrophthora* occurs in both localities, but is a serious menace only in Eastern Cape Province. The diseases affect grapefruit, lemons, and Navel, Valencia, and Cape Seedling orange trees, grapefruit and lemons being most susceptible to *D. natalensis* and grapefruit to *P. citrophthora*.

The symptoms presented by the two diseases differ in some respects. Thus, in attack by *D. natalensis*, the bark in advanced stages is loosely attached to the wood, whereas in advanced stages of *P. citrophthora* infection, it generally remains firmly attached, though small patches may sometimes break away. In such stages, the bark is very light grey to 'very light blackish-grey' when infection is due to *D. natalensis* and drab when it is caused by *P. citrophthora*. Further, with *D. natalensis*, the wood is discoloured like the bark, usually to a considerable depth, and sometimes throughout its full diameter, while with *P. citrophthora* the wood is light dull brown or fawn, to dirty grey, and the discoloration does not generally spread for more than 4 mm. into the wood.

Inoculation experiments proved that *Diplodia* gummosis was caused by *D. natalensis* and brown-rot gummosis by *P. citrophthora*. When pure cultures of the former were inoculated into the trunks or branches of healthy citrus trees, the lesions became self-limited after about eight weeks, and the adjoining tissue began to heal. Only one of ten branches of Triumph grapefruit inoculated with *D. natalensis* succumbed.

Conditions which favour attack by *D. natalensis* include a low nitrogen level

(resulting from over-irrigation, heavy rains, or insufficient application of available nitrogen), over- or under-irrigation, and excessive root cutting during cultural operations; frost and hail injuries are also contributing factors. The main factors likely to conduce to attack by brown-rot gummosis are allowing water to remain in contact with the bark of the trunk for a long period, deep planting, low budding, mechanical injuries to the bark of the trunk, and an inherently poor constitution.

Prevention consists in avoiding these conducing factors. In the case of *Diplodia* gummosis the trees must be supplied with sufficient available nitrogen for normal development. More available nitrogen than is usually given should be applied to trees which have experienced a set back owing to frost or hail, and to trees which are usually heavy bearers, such as lemons and Triumph grapefruit. The precautions to be taken against brown rot gummosis are as follows. During irrigation, water must not be allowed to contact the trunk of the tree. Newly planted trees should be irrigated in basins. The bud union must not be too near the soil. Injuries to the bark of the trunk, especially near the base, must be avoided during cultivation. Only trees with a vigorous root system should be planted, and congeniality between root stock and scion is essential.

If, even after preventive methods have been adopted, *D. natalensis* persists, the affected limbs should be cut away, and the exposed surface disinfected. In the case of *P. citrophthora* tree surgery should also be resorted to, or an injection of about 200 c.c. of a solution of methylene blue (1·5 gm. in 1,000 c.c. water) can be made into the trunk just above the lesion.

Milanez (F. R.) & Joffily (J.). **Estudo sobre a fusariose do Algodoeiro.** [A study of Cotton fusariosis.] — *Rodriguesia, Rio de J.*, v, 14, pp. 325-352, 9 pl., 1941. [English summary.]

The material used in the writers' studies of cotton wilt (*Fusarium vasinfectum*) was obtained from plants of the A.M. 41 variety grown in soil heavily contaminated with aqueous suspensions of the hyphae and spores of the pathogen, the presence of which was verified for the first time in Brazil in 1935 [*R.A.M.*, xvii, p. 35]. In all the sections examined the fungus was detected in the interior of the vessels, and as soon as the vitality of the adjoining tissues declined, they were also invaded by the hyphae. The penetration of the roots through layers of living cells is attributed to the death of the latter from the effects of fungal toxins. The multiplication of *F. vasinfectum* was observed in several regions of the vascular system from the root tracheae up to the leaf veins, the midrib of one of the leaves inspected being so densely infested that some of the vessels appeared to be occluded. The paucity of fungal elements commonly found in the vascular system of diseased plants, however, is in accordance with recent views on the toxic action of *F. vasinfectum*.

Microconidia, 4 to 9·4 by 1·4 to 2·2 μ, were observed, apparently for the first time, in the root tracheae, petioles, and secondary veins of living plants attacked by the wilt disease. The importance of these organs, especially in the leaves, in relation to the spread of infection is emphasized.

When sections of the inoculated plants were mounted in liquid paraffin between the slide and cover glass, the hyphae continued to grow, giving rise to microcultures, macro- and microconidia often developing within 24 hours and chlamydospores in five or six weeks. *F. vasinfectum* would thus appear to share with *Aspergillus flavus* (*Biochemic* [? or *Biochem. Z.*], clv, pp. 356-368, 1925) the property of utilizing liquid paraffin as a source of carbon and energy, and it is suggested that this characteristic may be of value in the diagnosis of cotton wilt and the isolation of its agent.

Crawford (R. F.). **Root rot and its control.** *Bull. N. Mex. agric. Exp. Sta.* 283, 13 pp., 1941. [Abs. in *Biol. Abstr.*, xvi, 6, p. 1451, 1942.]

In this summary of the present knowledge of *Phymatotrichum omnivorum* in New

Mexico it is stated that in the Mesilla and Pecos valleys rotations of less than three years' duration have proved of little value in the control of the disease [on cotton]. Soil disinfection may be used in small areas where applications of ammonium sulphate alone and in combination with other chemicals are practicable and efficient. Heavy manurial dressings tend to increase the saprophytic micro-organisms in the soil and to inhibit the fungus. Quarantines are employed to prevent spread from infected areas, and local spread is stopped by means of barriers.

Clark (F. E.) & Mitchell (R. B.). **Antibiosis in the elimination of Phymatotrichum omnivorum sclerotia from soil.**—Abs. in *J. Bact.*, xliv, 1, p. 141, 1942.

At Greenville, Texas, uncontaminated, viable sclerotia of *Phymatotrichum omnivorum* survived equally well in sterile, unamended and organic-amended soils. In non-sterile, amended soil, incubation temperatures favouring general microbial activity were more destructive to the sclerotia, 12, 30, 72, and 91 per cent. of which succumbed at 2°, 12°, 28°, and 35° C., respectively; at 28°, soil moisture contents of 35, 58, and 80 per cent. were found to be effective in the order given. Materials with narrow carbon: nitrogen ratios provided equal inhibition of the sclerotia with those of wider ratios less likely to meet good crop nutrient requirements.

King (C. J.) & Presley (J. T.). **A root rot of Cotton caused by Thielaviopsis basicola.** —*Phytopathology*, xxxii, 9, pp. 752–761, 3 figs., 1942.

Thielaviopsis basicola was isolated and identified in 1938 from the purplish-black, rotted vascular tissues of cotton roots collected at Sacaton, Arizona, in 1922 [*R.A.M.*, xix, p. 14], the disease being further observed in 1940 in the Upper Gila River Valley, nearly 200 miles distant from the original focus. In cultures on various standard media the cotton isolates resembled those from tobacco of Tennessee and Missouri origin, though minor differences in the colour and density of the colonies were observed, and on onion agar the cotton strain produced white or buff-coloured sectors which did not develop in the tobacco strain.

Under natural conditions the root rot, which is also characterized by a swelling of the tap-root near the collar, persists in the soil from one year to another, even in the absence of cotton cultivation. The fungus spreads slowly, and the damage caused by it is not ordinarily severe, except occasionally in the spring on American-Egyptian seedlings, which may recover temporarily during the hot weather, the occluded lesions, however, tending to resume activity in the autumn and to destroy the mature plants.

Cross-inoculation experiments with the cotton and tobacco strains of *T. basicola* on Maryland Broadleaf tobacco and Pima cotton were successful, nearly all the inoculated plants showing either external or internal symptoms of the root rot, though only a few died.

Müller-Kögler (E.). **Beobachtungen über das Verpilzen von Forleulenraupen durch Empusa aulicae Reich.** [Observations on the fungal infestation of Pine Noctuid larvae by *Empusa aulicae* Reich.] *Z. PflKrankh.*, li, pp. 124–134, 1941. [Abs. in *Zbl. Bakt.*, Abt. 2, cv, 10–11, p. 206, 1942.]

Mass mortality among the larvae of *Panolis flammae* Schiff. resulting from infection by *Empusa aulicae* was observed in the silvicultural district of Tornau (Germany), involving 93·5 per cent. of the total larval population at the end of a three-day epidemic. The infested insects, mostly of the fifth instar, were clinging to the lower sides of the pine needles and had assumed a dirty brownish-green to blackish discoloration.

Pepple (A.) & Fowlkes (W.). **The diagnosis of primary cutaneous blastomycosis (Gilchrist's disease).**—*Virginia med. Mon.*, lxix, 7, pp. 374–378, 5 figs., 1942.

This is a discussion and review of the literature on cutaneous blastomycosis

(*Blastomyces dermatitidis*), with special emphasis on differential diagnosis. The disease is prevalent in the Middle West, notably in the vicinity of Chicago, and a number of cases have been reported from Virginia.

Ray (L. F.) & Rockwood (Ethel M.). **Sporotrichosis : report of a case in which it was resistant to treatment.**—*Arch. Derm. Syph., Chicago,* xlvi, 2, pp. 211–217, 4 figs., 1942.

In the writers' cultures on Sabouraud's agar of *Sporotrichum schenckii* [*R.A.M.*, xx, p. 406], isolated from the arm of a 65-year-old woman at the Massachusetts General Hospital, Boston, the colonies at the end of a month had attained a diameter of 4 cm. and were irregularly furrowed on the dark brown central plateau with radial convolutions towards the buff-coloured periphery. Groups of conidia, varying individually from cigar- to pear-shape and occupied in the middle third by a dark-staining nucleus, were directly attached in rosettes or 'puff-balls', consisting of ten and twenty spores, respectively, to the sides and tips of the slender branching hyphae. This is only the sixth case of the disease to be reported from New England.

Negroni (P.). **El problema de las onixis micóticas no específicas.** [The problem of the non-specific onychomycoses.]—*Rev. argent. Dermatosif.*, xxiv, 1, pp. 194–199, 1940.

The following fungi were isolated from 17 out of 30 cases of onychia studied by the author at the Ramos Mejía Hospital, Buenos Aires: *Trichophyton rubrum*, alone and in association with *Aspergillus sydowi* (which also occurred four times unaccompanied [*R.A.M.*, xx, p. 165]) or unidentified organisms; *T. interdigitale* (five times, always in a pure state); *A. versicolor* in conjunction with *Scopulariopsis* and *Candida parakrusei* in the same patient; *Torulopsis minor* and *Hyalopus onychophilus* [ibid., xi, p. 576] in one case each; and species of *Penicillium* and *Torulopsis*, the latter both alone and accompanied by *Aspergillus* and *Trichophyton*.

Negroni (P.). **Epidemia de tiña en Caballos producida por el Trichophyton flavum.** [An epidemic of ringworm in Horses produced by *Trichophyton flavum*.]—*Rev. argent. Dermatosif.*, xxv, 3, pp. 363–368, 5 figs., 1941.

Attention is drawn to the existence of foci of equine ringworm in Buenos Aires and San Isidro. Material from the eight racehorses examined yielded *Trichophyton flavum*, which was cultured on Sabouraud's honey agar. At the end of a month the cerebriform, pulverulent, chamois-yellow colonies measured 2·5 to 3 cm. at laboratory temperature. Lateral, terminal, or occasionally intercalary, piriform aleuriospores were the only organs produced. Inoculation experiments on guinea-pigs gave positive results.

Negroni (P.). **Sobre un tipo particular de 'onixio blastomicética'.** [On a particular type of 'blastomycetic onychia'.]—*Rev. argent. Dermatosif.*, xxiv, 1, pp. 217–225, 3 figs., 1940. [French and English summaries.]

Descriptions are given of eleven cases of onychia of fungal origin, nine of which presented the peculiarity of being unconnected with paronychia. The causal organisms yielded by five of the aberrant cases were *Candida albicans* (three), *C. zeylanoides*, and *C. chalmersi* [*C. parakrusei*], and by the two typical (1) *C. albicans* and *C. aldoi* [*C. albicans*], and (2) *C. intermedia* and *C. tropicalis* [*R.A.M.*, xx, p. 258].

Pardo-Castello (V.) & Ferrer (I.). **Pinta : mal del pinto ; carate.**—*Arch. Derm. Syph., Chicago,* xlv, 5, pp. 843–864, 9 figs., 1942.

In connexion with the recent confirmation by F. Leon y Blanco in Mexico of the spirochaetal origin of 'pinta', 'mal del pinto', or 'carate', a review is given of previous outstanding contributions to the literature on this disease, which was previously

attributed to infection by fungi (including *Aspergillus* and *Penicillium* spp.) [*R.A.M.*, vi, p. 31].

CARRIÓN (A. L.). **Chromoblastomycosis.**—*Mycologia*, xxxiv, 4, pp. 424–441, 6 figs., 1 diag., 1942.

After reviewing the history, geographical distribution, and clinical features of chromoblastomycosis [*R.A.M.*, xx, pp. 164, 202; xxi, p. 289], the author states that repeated observations on many isolates from different parts of the world show that sporulation in the fungi associated with the disease may be of the *Hormodendrum* (*Cladosporium*), *Phialophora*, or *Acrotheca* type. A few of the fungi concerned appear to sporulate by one or other of these methods exclusively, but in most of them at least two occur simultaneously in the individual isolates. The organisms behaving in this manner have been classified as two species of *Fonsecaea*, *F. pedrosoi* (Brumpt) Negroni and *F. compactum* Carrión (represented by one isolate).

The different types of sporulation characteristic of *F. pedrosoi* do not occur in the same proportion in all strains, and the group has therefore been subdivided into a number of varieties in accordance with the predominant method of sporulation [ibid., xx, p. 164].

F. pedrosoi var. *typicus* corresponds morphologically with Brumpt's original description of *H. pedrosoi*. In this fungus, the *Acrotheca*-like sporulation reaches its highest development, the *Hormodendrum* heads are scant, abnormal, or depauperate and the *Phialophora* stage rare or missing. In *F. pedrosoi* var. *cladosporioides*, *Hormodendrum* is the predominant character. In *F. pedrosoi* var. *phialophorica* (originally described as *P. macrospora*) the *Phialophora* method of sporulation predominates, while typical *Acrotheca* heads are produced and *Hormodendrum* is wanting. Lastly, *F. pedrosoi* var. *communis* shows all three methods of sporulation, and includes numerous intergrading forms which represent connecting links among the other three varieties.

As regards the proper generic name for these fungi, differences of opinion exist as to whether it should be *Hormodendrum*, *Phialophora*, or *Fonsecaea*. The objections to the use of *Hormodendrum* are that it would not admit certain isolates of the varieties *typicus* and *phialophorica*, in which the *Hormodendrum* sporulation has become obsolete, and that its application to the species *pedrosoi* has been responsible for most of the confusion. Inclusion in *Phialophora* would be even more confusing. Among the numerous specimens of *pedrosoi* so far studied, only in one does the *Phialophora* sporulation predominate. The author suggests that, as a matter of convenience, *Fonsecaea* is the most suitable name. The genus is legitimate and comprehensive, and covers without strain all varieties of the species *pedrosoi*. It represents a mycologic group possessing distinct pathogenic properties.

The *phialophorica* variety is accordingly named *F. pedrosoi* var. *phialophorica*, with a Latin diagnosis, synonyms being *P. macrospora* [ibid., xvi, pp. 38, 251], *P. verrucosa* [ibid., xix, p. 406], and *Acrotheca pedrosoi* [ibid., xx, p. 164].

RÖDER (K.). **Einige Untersuchungen über ein an Hanf (Cannabis sativa L.) auftretendes Virus.** [Some investigations of a virus occurring on Hemp (*Cannabis sativa* L.).]—*Faserforsch.*, xv, pp 77–81, 1941. [Abs. in *Zbl. Bakt.*, Abt. 2, cv, 10–11, pp. 195–196, 1942.]

For some years past hemp on low-lying moorland soils in Germany has been affected by a foliar chlorosis believed to be due to a virus. Diseased stalks are noticeably smaller and thinner than those of healthy plants and the yield of seed is appreciably lower. The disorder is communicable from infected to healthy plants by means of expressed juice, but the symptoms thus induced are atypical. The seeds of diseased plants are reported to give rise to chlorotic progeny. On the basis of the

normal ratio of one male to one female plant twice as many diseased individuals were counted among the latter as in the former sex.

Jenkins (Anna E.) & Tilford (P. E.). **Pedicel necrosis of the Rose.**—*Amer. Rose Annu., 1941*, pp. 180–181, 1 fig. (facing p. 91), 1941.

Pedicel necrosis was first observed by F. Weiss about ten years ago in the District of Columbia on the Radiance variety, and later in the same season by the senior writer on Red Radiance. In July, 1940, the disease was prevalent on both varieties in Ohio, and reports of its occurrence have also been received from New York, New Jersey, and Oregon. The decay is associated with a bending of the pedicel in a more or less even curve and a consequent drooping of the blossom, which slowly withers, remaining about half open for several days before the petals fall. The first symptom of the necrosis is a reddening of the portion of the pedicel most exposed to the sun's rays, the resultant lesion sometimes expanding to girdle the stem for an inch or more. The affected area, which assumes a striking, often purple, discoloration, appears to comprise only a few outer cells. Below the node the stem remains green. The second (September) crop of roses on the same plants in Ohio were free from pedicel necrosis, though some drooping was still observed. No evidence of fungal involvement was obtained from cultures of the affected tissues.

Lyle (E. W.). **Texas black-spot control work.**—*Amer. Rose Annu., 1941*, pp. 172–175, 1941.

In 1940, at the Tyler branch of the Texas Agricultural Experiment Station, the following percentages of rose black spot [*Diplocarpon rosae*: *R.A.M.*, xix, p. 348] control on the Caledonia variety were given by seven applications of the following fungicides: cupro-K spray (copper oxychloride) 4 lb. to 50 gals. water plus an equal amount of wheat flour, 95; cuprocide 54 Y spray (cuprous oxide) 3 lb. to 100 gals., 89; mike sulphur spray, 48; and sulphur-copper dust (90 per cent. Spider brand sulphur plus 10 per cent. cuprocide GA), 76. The gain in weight of plants treated with sulphur-copper dust amounted to 113 per cent. In another test with the same preparation in a plot of 164 Hybrid Teas of several susceptible varieties, the number of diseased leaflets per plant on 1st October (after 18 applications with a hand duster delivering 17·3 lb. per 100 plants) was only 1·1 compared with 4 on 16th April, when the first treatment was made.

Lyle (E. W.) & Massey (L. M.). **Die-back of Roses.**—*Amer. Rose Annu., 1941*, pp. 176–178, 3 figs., 1941.

'Die-back' is not a specific disease of the rose, but may be part of the symptom complex of winter injury, deficiencies or excesses in the supply of nutrient elements or water, or the indirect sequel to cankers (*Cryptosporella umbrina* and *Coniothyrium fuckelii*) or other agencies tending to lower the vigour of the plants. Defoliation due to black spot [*Diplocarpon rosae*] or other causes may predispose the host to infection by normally saprophytic fungi, notably *Diplodia* spp. [*R.A.M.*, xix, p. 348]. In an experiment at Tyler (eastern Texas) in which half the bushes of the Margaret McGredy variety were protected from rain by a glass covering and the remainder left exposed, the former remained free from black spot, while the latter contracted severe infection followed by defoliation and die-back. Other varieties highly susceptible alike to black spot and die-back are Mrs. Pierre S. du Pont, Souvenir de [illegible] Pernet, and Mrs. A. R. Barraclough, whereas resistance to both diseases has been shown by Radiance, Étoile de Hollande, Edith Nellie Perkins, and Lady Hillingdon.

Dimock (A. W.). **Controlling Septoria leafspot of the Chrysanthemum.**—*Bull. Chrysanth. Soc. Amer.*, x, 1, pp. 6–11, 1942. [Abs. in *Chem. Abstr.*, xxxvi, 17, p. 5309, 1942.]

The results of two years' experiments indicate that chrysanthemum leaf spot

(*Septoria*) [*chrysanthemella*: *R.A.M.*, xix, p. 475] is entirely amenable to control by well-timed and thorough applications of 4–4–100 Bordeaux mixture, Grasselli copper compound A (copper oxychloride) [ibid., xxi, p. 245] at a dosage of 2·36 lb. in 100 gals. water, or C–O–C–S (copper oxychloride sulphate), 1·89 lb. in 100 gals. Fungisul (a wettable sulphur, used at the rate of 3 lb. in 100 gals.), and spergon (2 to 6 lb. in 100 gals.) were slightly less effective, but the former is recommended, either as a supplement to, or in place of, the copper-containing preparations where rust [*Puccinia chrysanthemi*] or mildew [*Oidium chrysanthemi*] presents a problem.

Kendrick (J. B.) & Baker (K. F.). **Bacterial blight of garden Stocks and its control by hot-water seed treatment.**—*Bull. Calif. agric. Exp. Sta.* 665, 23 pp., 6 figs., 1942.

A bacterial blight of garden stocks (*Mathiola* [*Matthiola*] *incana*) is reported to have occurred in commercial seed and cut-flowers plantings and in home gardens in the coastal areas of California since 1933, causing death or stunting of many plants and serious reduction or even total loss of the seed crop in some seasons. The disease is characterized by a soft, water-soaked condition of the main stem and growing-tip and a general collapse in young seedlings, and by dark, sunken lesions on the main stem and lateral branches in older plants, followed sometimes by death through girdling. The causal organism, named by the author *Phytomonas incanae* n.sp., resembles closely *P.* [*Xanthomonas*] *campestris*, to which apparently the same disease has been attributed in Tennessee [*R.A.M.*, xi, p. 517] and New South Wales [ibid., xxi, p. 291], but differs from it in that it produces neither acid from maltose and l–arabinose in synthetic media, nor indol; does not reduce starch; and varies very slightly in cell measurements. The main difference, however, lies in their pathogenicity, the new species failing to infect cabbage or cauliflower plants in the greenhouse while inducing typical symptoms on stocks and *X. campestris*, on the other hand, failing to induce infection in stocks. The disease was easily reproduced in the greenhouse by spraying a water suspension of the bacteria on young plants with and without wounding the stem tissue. The causal organism was recovered from the vascular system of all parts of the plant and is seed-borne. The disease in stocks was partly controlled in the greenhouse and greatly reduced in the field by immersion of the seed (preferably in small amounts in loose cheese-cloth bags) in water at 53° to 55° C. for ten minutes followed by prompt cooling in cold water. The treated seed can be stored for several months. Field evidence indicates that the causal bacterium persists in the soil, which it is advisable therefore to sterilize with steam or to drench to a depth of 6 in. with a 1 in 50 solution of formaldehyde. A two- to three-year rotation is also advocated. The disease can be spread by drainage water and by land-levelling operations.

Milbrath (D. G.). **Probable virus disease of Pittosporum daphniphylloides.**—*Bull. Dep. Agric. Calif.*, xxix, 3, pp. 158–159, 1 fig., 1940. [Received November, 1942.]

Pittosporum daphniphylloides plants growing near Chico, California, were observed to show a strong mosaic mottling of the young leaves, the pattern consisting of dark green, irregular, frequently raised areas surrounded by light yellowish-green. The affected leaves were asymmetrical, with irregular margins. Occasionally, the lamina on one side of the midrib was about a quarter of the size of that on the other. The leaves of affected plants were shorter and narrower than those of normal plants, and the diseased plants were, as a whole, dwarfed. Patch bark grafts from affected plants to three healthy plants gave characteristic symptoms on one plant, indicating that the disease is due to an infectious, transmissible virus.

Valleerpool (T. C.). **Pythium root rot of grasses.**—*Sci. Agric*, xxii, 11, pp. 674–687, 8 figs., 1942.

During the last few years there has been an increase in the grass acreage for hay

and seed and in seeded pasture in the Canadian prairies, with the result that the question of grass diseases and their possible effects on subsequent crops in the rotation has become important. In this paper the author deals with investigations on *Pythium* root rot of grasses, supplementing those of the same writer and his collaborators on browning root rot of cereals (*P.* spp.) in Saskatchewan [*R.A.M.*, xix, p. 696]. In the early summer of 1941 the author isolated strains of *P. aristosporum*, *P. arrhenomanes*, and *P. graminicola* from lesions in the root of brome grass (*Bromus inermis*), crested wheat grass (*Agropyron cristatum*), and slender wheat grass (*A. pauciflorum*) growing on farms in north-central Saskatchewan. All these species were ascertained experimentally to be highly pathogenic to wheat seedlings, on which they produced a severe brown necrosis of the roots. *P. tardicrescens* and *P. volutum* are also of major concern to grasses and cereals. Strains of *P. de Baryanum* and close allies, obtained at the same time, were slightly to moderately pathogenic to wheat under the same conditions. Evidence obtained also indicated that *Pythium* damage to cereals and grasses is as common and serious in North Dakota and the adjoining States as it is in Saskatchewan [ibid., xxi, p. 366].

Pythium damage to grasses is of four types: a pre-emergence killing of the seedlings, in which both roots and shoots are attacked; damping-off or early seedling-killing, resulting from rotting of the roots and stem bases; lesions of the coarser roots and invasion of many of the fine laterals in the late seedling stage; and lesions of the new batches of roots produced on perennial grasses during later growth periods. The first two types cause reduction of stand, but the damage in the aggregate caused by types three and four may also be considerable. The pre-emergence and damping-off types of injury seldom occur on cereals in Saskatchewan.

All cultivated grasses in Saskatchewan are attacked. Millet (*Setaria italica*) and sorghum are highly susceptible. An experiment was conducted in which brome grass, crested wheat grass, slender wheat grass, lucerne, sweet clover (*Melilotus alba*), and flax were grown in the greenhouse in pots containing soil from wheat fields heavily infested with *Pythium* browning root rot and in other pots containing healthy soil. The dry weights of the plants in the infected soil were found to be 57·5, 46·9, 82·9, 66·6, 101·2, and 92·9 per cent. of those for the plants in healthy soil, for the different host species, respectively. In a second experiment the corresponding figures were 76·2, 58·4, 44·9, 56·7, 82, and 118·4 per cent.

In another experiment, brome, crested wheat, and slender wheat grasses were grown in *Pythium*-infested, steam-sterilized infested, and normal soil maintained at 30 and 60 per cent., respectively, of the moisture-holding capacity. The averages of germination for all three hosts together in the three different soils at 30 per cent. moisture capacity were, respectively, 68·6, 78, and 64·5 per cent., and at 60 per cent. moisture capacity 70, 86·6, and 68·5 per cent., the corresponding figures for the dry weights being 3·78, 12·05, and 8·69 gm. and 10·92, 19·45, and 13·08 gm., respectively. The large increase in growth and germination in the steam-sterilized over the infested soil is due to the increase in nutrients and the destruction of root-destroying fungi in the steamed soil. Apparently the factors limiting yield were more effective in the dry than in the moist soil.

The effect of various fertilizers on grasses grown in *Pythium*-infested soil under greenhouse conditions showed that phosphate-containing fertilizers, especially ammonium phosphate (11–48), increased growth considerably. Ammonium sulphate alone under the same conditions was without effect or slightly deleterious.

It is tentatively suggested that if grasses are to be grown on fields where severe browning root rot of wheat has occurred, and where economical increases in yield have resulted from phosphatic fertilizer amendments, at least trial-strip applications of ammonium phosphate should be made.

Cormack (M. W.). **Varietal resistance of Alfalfa and Sweet Clover to root and crown rotting fungi in Alberta.**—*Sci. Agric.*, xxii, 12, pp. 775–786, 1942.

The results are given of seven years' field tests at different localities in Alberta to determine the resistance of all available hardy varieties and strains of lucerne and sweet clover (*Melilotus alba*, *M. officinalis*, and *M. suaveolens*) to crown- and root-rotting fungi.

The pathogens attacking dormant plants of these two hosts in early spring are, in descending order of destructiveness, the low-temperature Basidiomycete [*R.A.M.*, xxi, p. 143], *Cylindrocarpon ehrenbergi*, *Sclerotinia sativa* Drayton & Groves [a description of which is expected to appear in *Mycologia*], and *Fusarium avenaceum*. Similarly, the fungi attacking growing plants of sweet clover are *Phytophthora cactorum*, *F. culmorum*, *F. avenaceum*, and *S. sativa*. Lucerne was much more resistant than sweet clover to all these organisms, except the low-temperature Basidiomycete.

Of the lucerne varieties tested for resistance to *C. ehrenbergi* and *S. sativa*, the most resistant was *Medicago falcata*, the Cossack and Viking varieties coming next, but probably only slightly above the others, including Grimm. *M. falcata*, Cossack, and Viking may possibly possess some resistance to the low-temperature Basidiomycete, but all varieties of sweet clover appear to be highly susceptible.

Of the sweet clover varieties tested for resistance to *S. sativa* those belonging to *Melilotus alba* were more susceptible than those belonging to *M. officinalis*. Redfield Yellow (*M. suaveolens*) was only slightly less susceptible than varieties of *M. alba*, but it showed some resistance to *C. ehrenbergi* as did the Arctic variety of *M. alba*.

A strain of Alpha sweet clover (S 30–35–1–8) developed at Saskatoon was highly resistant to *P. cactorum*.

Anderson (A. J.). **Molybdenum deficiency on a South Australian ironstone soil.**—*J. Aust. Inst. Agric. Sci.*, viii, 2, pp. 73–75, 3 figs., 1942.

Ironstone soils in the Meadows area of South Australia have for many years failed to produce satisfactory yields of pasture, even with the addition of superphosphates. Improvement, however, always results when timber is burnt on the ground, or when wood ashes are applied to the pasture. Lime and other alkaline earths very slightly improved the yields, but copper, manganese, zinc, boron, iron, and potash (singly and in various combinations) failed to effect any improvement.

In 1941, ammonium molybdate at the rate of 1 lb. per acre was added to a mixture of the above-mentioned six elements and applied to a seeded pasture of subterranean clover [*Trifolium subterraneum*], perennial rye-grass [*Lolium perenne*], and *Phalaris tuberosa* in plots; the yield of *T. subterraneum* amounted to 26·63 cwt. dry matter per acre, as against 1·93 to 2·74 cwt. for other treatments.

A test was then made with the same soil in pots, when it was shown that molybdenum applied as sodium molybdate at the rate of 2 lb. per acre increased the yield of lucerne [*R.A.M.*, xxi, p. 336] from 1·6 to 3·13 gm. dry matter per pot. The leaves of the molybdenum-treated plants were dark green, while those of the remainder were yellowish to pale green. In a second series of pot cultures 1 lb. per acre of sodium molybdate markedly increased the development of subterranean clover.

Lefebvre (C. L.). **Claviceps yanagawaensis in imported seed of Japanese Lawn Grass.**—*Phytopathology*, xxxii, 9, pp. 809–812, 2 figs., 1942.

Japanese lawn grass (*Zoysia japonica*) seed imported into the United States in 1939 was found to contain a high percentage of sclerotia of *Claviceps yanagawaensis* Togashi, hitherto unknown in the country. They measured 0·25 to 1·5 by 0·5 to 1 mm. and were of a greyish-violet colour, sometimes with a superficial yellowish-green gloss, flattened, usually somewhat curved and nearly always entangled with the shiny, flattened, indurated glumes of the host. Germination was ordinarily

effected by the production of a single stroma from the apical third of the sclerotium, but under certain conditions more stromata may develop. The stipe length in the specimens examined by the writer (4 to 16 mm.) exceeds the corresponding measurement given by Togashi, while the width in the former (0·3 to 0·5 mm.) falls slightly short of the Japanese dimensions (*Trans. Sapporo nat. Hist. Soc.*, xiv, pp. 280–285, 1936), but the figures for the heads (0·3 to 1·0 by 0·4 to 1·5 mm.), perithecia (180 to 320 by 70 to 190 μ), asci (85 to 165 by 4 to 8 μ), and ascospores (75 to 135 by 1 to 2·25 μ), respectively, cited for *C. yanagawaensis* in its native habitat agree well with those of the imported material.

The immersion of infected *Z. japonica* seed in a 75 per cent. solution of sulphuric acid for 20 to 30 minutes destroyed the ergot sclerotia and simultaneously improved the germination of the grass, from which it would appear that seed so treated may safely be distributed for planting.

A rye hybrid known to be highly susceptible to *C. purpurea* was inoculated with the ascospores of *C. yanagawaensis*, but no infection resulted.

Garber (R. J.) & Chilton (S. J. P.). **The occurrence and inheritance of certain leaf 'spots' in Sudan Grass.**—*J. Amer. Soc. Agron.*, xxxiv, 7, pp. 597–606, 4 figs., 1942.

Details are given regarding the heritable nature of leaf spots occurring on selfed lines of Sudan grass (*Sorghum vulgare* var. *sudanense*) grown in the nursery at State College, Pennsylvania, in 1941. No micro-organisms could be isolated from the foliar spots, which may be responsible for considerable damage, destroying large areas, particularly of the lower leaves. Apart from the colour factor, the inheritance of the leaf spots appears from the F_2 and F_3 data of crosses involving three types of the disorder to be complex, the lesions varying in size, shape, number, and time and place of development on the host.

Moore (M. H.) & Steer (W.). **The East Malling Spray Calendar, 1942 edition.**—*Rep. E. Malling Res. Sta., 1941*, p. 68, 1942.

Notes are given on the new edition (for 1942) of the East Malling Spray Calendar for fruit and hops, the Calendar itself being appended to the Report. This is a completely new version, in which almost all the recommendations originally made when the Calendar was first issued, eight years ago, have been modified.

Wormald (H.). **The grey mould of fruit and Hops. Weeds as possible sources of infection.**—*Rep. E. Malling Res. Sta., 1941*, pp. 44–47, 1942.

During the first fortnight of June and the first half of the autumn, 1941, grey mould (*Botrytis cinerea*) [*R.A.M.*, xx, p. 169] was widely prevalent in south-eastern England on many cultivated plants and weeds. It was particularly abundant on the flower heads of Compositae, including the sow thistles *Sonchus arvensis* and *S. oleraceus*, which make vigorous growth if left undisturbed in cultivated ground. The practice of allowing weeds to grow, so that they can be ploughed in as a cover crop, is inadvisable if there are valuable crops in the vicinity susceptible to grey mould, such as fruit, hops, field beans, or lettuce. In such cases, a recognized cover-crop mixture is to be preferred. Not all cover-crop plants are immune from *B. cinerea*, since a few fructifications have been found on the flower-heads of red and white clover [*Trifolium pratense* and *T. repens*], petals of common vetch, and the pods and flower-stalks of lucerne. These, however, are much less susceptible than some of the composite weeds, especially the sow thistles. Crops that admit of clean cultivation should be kept as free from weeds as possible, particularly bush fruit, hops, field beans, and vegetables, and if a cover crop is required for humus production a cover crop seed mixture should be sown.

Wormald (H.). **Notes on plant diseases in 1941.**—*Rep. E. Malling Res. Sta., 1941*, pp. 40–42, 1942.

These notes [cf. *R.A.M.*, xxi, p. 24] contain the following items of interest. In June, 1941, twigs of *Pyrus japonica* from a garden near Maidstone were received showing clusters of dead flowers bearing numerous pustules of *Monilia cinerea* [*Sclerotinia laxa*]. Apples, mostly of the Grenadier variety, showing the black-apple condition while still on the tree, were infected by *S. fructigena* [ibid., vi, p. 37]. One case of severe pear canker due to *Nectria galligena* was observed on young trees. A few yards away, some badly cankered apple trees were found, from which the infection appeared to have spread to the pears, those nearest the apples being the most severely affected. When young apple or pear trees are planted, all cankers should be removed from older trees in the vicinity before the young trees are pruned.

Bacterial blossom blight of pears [?*Pseudomonas prunicola*: ibid., xxi, p. 25] was very destructive in Kent and other parts, all or most of the blossom on some trees being destroyed.

Plum leaves severely attacked by rust [*Puccinia pruni-spinosae*: ibid., xix, p. 418] were received from various localities in southern England, with complaints of serious premature leaf fall in some instances. Attempts at control should be made in areas where the disease is serious every year, by removing anemones showing the cluster-cup stage from gardens in the vicinity of plum orchards and spraying the trees with Bordeaux mixture when the fruit is about half-grown, and again (if the disease appears to be spreading) immediately after picking [ibid., xx, p. 369; xxi, p. 244].

Cooley (J. S.). **Wound dressings on Apple trees.** *Circ. U.S. Dep. Agric.* 656, 18 pp., 2 diags., 4 graphs, 1942.

A full account is given of experiments carried out at Hood River, Oregon, from 1929 to 1931, and from the latter year until 1938 at Arlington, Virginia, to determine the relative merits of a number of wound-dressings for the protection of the limbs of mature apple trees against invasion by the perennial canker fungus, *Neofabraea perennans* [*R.A.M.*, xix, p. 226]. Internodal or side wounds made at monthly intervals for two years were treated with two wax-like dressings, Nos. 540 and 541, white lead and linseed oil, and shellac, of which the last-named induced more extensive callus formation and less dying or longitudinal extension of the injury than any other preparation used. Generally speaking, dressing No. 541, consisting of eight parts of rosin and three of sardine oil, proved superior in healing properties to No. 540 (seven parts rosin and three each of sardine oil and copper soap) or white lead and linseed oil, and was further effective against the depredations of the woolly aphis (*Eriosoma lanigerum*).

Isaac (W. E.). **The incidence of superficial scalds in Apples grown in South Africa in relation to storage temperatures.** *J. Pomol.*, xx, 1–2, pp. 12–23, 3 graphs, 1942.

Two types of scald are distinguished on six South African apple varieties held at different storage temperatures [*R.A.M.*, xx, p. 51], viz., 'superficial', roughly corresponding to the 'scald', 'apple scald', and 'superficial scald' of previous workers but also including dirty grey or green, light to medium brown or dark discolorations; and 'frigescence superficial', characterized by medium brown discoloration diffused over the surface, the former tending to develop late in the storage period on Ohenimuri, Granny Smith, and White Winter Pearmain at relatively high temperatures (3·3° to 7·2° C.), and the latter on Red Delicious, Granny Smith, and Wemmershoek at low ones (−1·7° to 1·1°) though not necessarily increasing in prevalence and intensity with fall of temperature over this range. The character of the defect on Rome Beauty did not conform to either of these types, being prevalent at all the storage temperatures employed except −1·7° with a tendency to greater severity, more particularly of the spotted form of it, at the higher range. Pre-storage conditions

are thought to affect the development of scald in this variety to a greater extent than is the case with the others.

The spotted superficial scald of Rome Beauty agrees in some respects with Jonathan spot, from which it differs, however, in its restriction to the later storage period, the latter disorder developing early, sometimes even while the fruit is still on the tree, and in the absence of underlying tissue necroses. Frigescence superficial scald presents certain analogies with soft scald [ibid., xix, p. 479] and internal browning of Yellow Newtowns [ibid., iii, p. 403]. Soft scald may indeed be a very severe but more localized form of frigescence superficial scald. The temperature relations of the two disorders are similar and tests with oiled wrappers showed that these had little or no effect on the incidence of soft scald and varied in effectiveness against frigescence superficial scald, though they were generally useful in eliminating or reducing this disorder. The fact that the severity of internal browning of Yellow Newtowns increased with decreasing temperature from 7·2° to —1·1°, while it was not serious at or above 7·2°, suggests a closer affinity to frigescence superficial than to superficial scald.

Welsh (M. F.). **Studies of crown rot of Apple trees.**—*Canad. J. Res.*, Sect. C, xx, 9, pp. 457–490, 5 figs., 1942.

Crown rot is stated to be of considerable economic importance in the irrigated apple orchards of the Okanagan Valley, British Columbia, where it attacks all commercial varieties at all ages. The rot is usually confined to those portions of the trunk and roots that lie within 6 in. of the ground-level, and spreads very rarely below 9 in. or above-ground. The rot may girdle a large tree and spread several feet along the surface roots in the course of a few weeks, or it may cease to spread entirely after producing a small patch or girdling one single root. Not infrequently trees were observed to lose one or two small roots each year, but never to suffer extensive damage. The rot is not apparent unless the tough outer layer of bark is scraped off, exposing the brown and soft remaining layers down to the cambium, beneath which there is no evidence of rotting. Recently rotted tissues are light yellow-brown, and old infections a darker brown, no definite margin being formed, except where the spread of the rot has ceased. In the rare cases where the rot spreads to above-ground tissues, a zonate effect is produced by alternating layers of very light brown and darker brown tissues of a firm, soapy consistency, and sometimes patches of liquid exudate appear just above the upper margin of the rotted bark. Secondary symptoms in the upper part of the tree appear after the rot has progressed for some time and comprise bronzing and yellowing of the older and dwarfing of the newly formed leaves, a reddish tinge of the bark, and small and conspicuously coloured fruits. When infection occurs in the early part of the summer, these symptoms develop in the same year, reappearing in a more pronounced form in the following spring, accompanied by a reduction of terminal growth; when the disease occurs late in the growing-season, the entire sequence of symptoms develops only in the second year.

Phytophthora cactorum was isolated from rotted tissues and produced, upon inoculation, typical crown-rot symptoms in 58 bearing and 50 one- and two-year-old apple trees in the field and in 93 two-year-old trees in the greenhouse. Isolation of the fungus proved somewhat difficult and was only possible from the tissues at the margin of active lesions. Evidence is adduced that the fungus is inhibited by bacteria, (in particular strain 452 b) in all but the marginal region. An alternative explanation of the difficulty of isolating *P. cactorum* might be that degradation products of dying host tissue are toxic to the fungus.

Field observations and the results of inoculation of two-year-old trees under controlled conditions in Wisconsin tanks in the greenhouse showed the disease to be favoured by high temperatures and high soil moistures. Thus, the incidence of the disease was highest at a soil moisture of 96 per cent. saturation at the highest tempera-

ture imposed, 32° C.; a reduction of soil moisture to 60 per cent. at the same temperature reduced the severity of the disease from 100 per cent. to zero. The effect of soil moisture was more prominent in the subsoil than in the locus of crown-rot attack, operating apparently as a factor predisposing the tree to infection. The results of field inoculation experiments indicated that initiation and spread of crown rot are discouraged when surface soil moisture levels fall below 25 per cent. of saturation. In cultural studies, the growth rate of *P. cactorum* increased steadily with the rise in temperature from a minimum of between 4° and 6·5° to 27°; the maximum temperature was about 32°, and death resulted from eight days' exposure to this temperature. The fungus was unable to survive desiccation in culture. A varying degree of resistance was evident in varietal tests. Dormant trees generally displayed a greater degree of resistance than those in active growth, the appearance of the disease in such trees being delayed and the spread slow. The presence of wounds proved essential for successful inoculation. Comparison of *P. cactorum* isolated from trunk cankers from Indiana [*R.A.M.*, xviii, p. 809] with those from crown rot disclosed hardly any differences in cultural characteristics or morphology; but the two isolates seemed to differ somewhat in their pathogenicity to various apple varieties, suggesting possible strain differences.

The principal recommendations for the control of crown rot, practised so far in British Columbia with partial success, include an examination of the crowns of all suspected trees in late summer and the removal of all rotted bark in the following spring, leaving the diseased crowns exposed until late autumn; the removal of girdled trees; the inarching of suckers or young seedling trees above the scarified lesions of partially girdled trees; and, finally, the reduction of irrigation to the minimum and the drainage of low-lying orchards. The present investigations have confirmed the necessity of reducing soil, especially subsoil, moisture, and stress the importance of avoiding wounds.

Ark (P. A.). **Control of crown gall of Peach in the nursery.**—Abs. in *Phytopathology*, xxxii, 9, p. 826, 1942.

Ceresan, mercuric cyanide, and mercuric iodide dusts, mixed with celite 500 at the rate of 15 gm. to 450 gm. and applied to well-washed peach pits [? in California], reduced the incidence of crown gall [*Bacterium tumefaciens*] from over 99 to 3·8, 13·9, and 4·3 per cent., respectively. Acidification of the soil by the admixture of sulphur lowered the P_H value from between 7 and 8·5 to 5 or 5·5, at the same time inducing a decrease of 20 to 30 per cent. in the amount of crown gall. Applications at the rate of 500 or 1,000 lb. per acre were harmless to the plants, but 2,000 lb. caused yellowing and stunting.

Hildebrand (E. M.). **Prune dwarf.**—*Phytopathology*, xxxii, 9, pp. 741–751, 5 figs., 1942.

Prune dwarf (prune virus 6 or *Nanus pruni* H.), originally reported only from Niagara County, New York [*R.A.M.*, xvi, p. 330], has since been observed in Canada [ibid., xxi, p. 146], where two severe attacks occurred on damson plums top-worked to the susceptible Italian (Fellenberg) prune. Both damson and Bradshaw plums may carry the virus in a masked form. The spread of infection is normally restricted to the immediately adjacent trees in an orchard, with occasional skips, suggesting the agency of an insect vector with a short flight range, possibly the green plum aphis [*Myzus mahaleb*], but insect transmission experiments have hitherto only yielded negative results. The fruit yield of affected plums of the prune type is much reduced, averaging less than 10 per cent. of the normal, whereas in Lombard, which sustains only foliar damage without abortion of the pistils, the drop is only slight, and the symptomless damson produces a normal crop.

The disease was successfully transmitted by bud-, cleft-, and whip-grafting from

Italian prunes to other varieties of the same type, in which the symptoms included severe foliar dwarfing and a light fruit set, and to Lombard (leaves only affected); Bradshaw and Reine Claude reacted very slightly, and the results obtained with *Prunus salicina*, Abundance, and Burbank were inconclusive or negative. Three separate lots of dormant Red June trees developed a line-pattern mottling [ibid., xxi, p. 146] in the greenhouse. Negative results were given by transmission tests from prune to cherry, whereas Elberta peaches responded to inoculation by temporary foliar symptoms resembling those of rosette [ibid., xxi, p. 371] and retarded fruit growth, especially on the suture side.

Richards (B. L.) & Hutchins (L. M.). **The western 'X' disease of the Peach in Utah : its etiology and significance.**—Abs. in *Proc. Utah Acad. Sci.*, xviii, pp. 13–14, 1941.

Western 'X' disease [*R.A.M.*, xxi, p. 260], first observed in northern Utah on *Prunus demissa* in 1937 and on the peach in 1939, is now known to occur in a severe form in five counties of the State, the peach industry of which is seriously threatened. Up to 80 per cent. infection has been observed, the maximum incidence being found in older orchards. In 1939, 23·8 per cent. of the trees in orchards of all ages were diseased, and in 1940, infection was present in 36·7 per cent. of the trees in 14 six- to twenty-year-old orchards, the spread of the virus between 1939 and 1940 in twelve orchards ranging from 2·7 to over 300 per cent. A comparable rate of diffusion has been noted in *P. demissa*, diseased plants of which have been seen along the foothills running parallel with the peach-growing areas from Brigham City in the north to Salt Lake City in the south. The incubation period of the virus, grafted from diseased to healthy peaches, ranges from five weeks to sixteen months. Intercommunicability between peach and *P. demissa* has not been established.

Massee (A. M.). **Aphis transmission of Strawberry crinkle in Great Britain.**—*J. Pomol.*, xx, 1–2, pp. 42–47, 1942.

Details are given of experiments at the East Malling Research Station in 1937, 1938, and 1941 on the transmission of strawberry crinkle by means of the aphid, *Capitophorus fragariae* [*R.A.M.*, xxi, p. 380]. Mild symptoms of the disorder developed in healthy plants of the common woodland strawberry, *Fragaria vesca*, colonized either by the adult or immature stages of apterous viviparous females previously fed on plants of the same species showing symptoms of like intensity. Severe and mild manifestations of crinkle, respectively, were induced in healthy Royal Sovereigns by colonization with alate viviparous females after feeding on plants of the same variety showing crinkle symptoms of corresponding intensity. This result confirms the conclusion of Harris and King that the mild and severe forms of crinkle are etiologically distinct. The wingless forms of the vector are doubtless responsible for the spread of the virus within any given strawberry bed or field, while the winged forms carry the virus to other fields in the neighbourhood during the spring migrating period. Complete control of the vector is stated to be obtainable by fumigating the plants in the field with nicotine vapour.

Wormald (H.) & Montgomery (H. B. S.). **Strawberry leaf blotch.**—*Rep. E. Malling Res. Sta., 1941*, p. 44, 1942.

During 1941, the disease recently described by the authors as strawberry leaf blotch [*R.A.M.*, xxi, p. 86] and associated with a fungus resembling *Phyllosticta grandimaculans* Bubák, 1912, was found in seven different localities in Kent, mostly on Royal Sovereign plants, but occasionally on Huxley's Giant. The fungus may be the same as that described by Laibach in 1908 under the name of *Zythia fragariae*.

Tims (E. C.) & Bonner (Frances). **Method of obtaining pure cultures of Corticium stevensii from sclerotia.**—*Phytopathology*, xxxii, 9, pp. 824–825, 1942.

At the Louisiana State University, pure cultures of *Corticium stevensii*, the agent of fig and tung [*Aleurites*] thread blight [*R.A.M.*, xxi, pp. 206, 296], were obtained by the immersion of sclerotia (not more than one year old) from twigs of these hosts (predominantly the former) in a mixture of 1 in 1,000 mercuric chloride in 50 per cent. alcohol for two minutes, followed by washing in sterile water and plating on water agar. In some cases a supplementary dip in calcium hypochlorite was given, and two lots were flamed after immersion in alcohol. The percentages of sclerotia (1,500 in all) giving rise to *C. stevensii* ranged from 35 to 94, but the numbers free from contamination were much lower.

Croucher (H. H.). **The menace of leaf spot.**—*J. Jamaica agric. Soc.*, xlvi, 1–2, pp. 20–21, 1942.

After briefly reviewing the history of the spread of banana leaf spot [*Cercospora musae*] in the Caribbean, the author states that under Jamaica conditions [*R.A.M.*, xxi, p. 148] regular, efficient spraying against the pathogen must become a routine operation if good-quality fruit is to be produced. By the end of 1940 the Banana Leaf Spot Control Board had issued (free) nearly 3,000 units of spraying equipment. If fully used, these units could spray over 50,000 acres of bananas every three weeks. The records show, however, that only 25,000 to 30,000 acres are being sprayed with even approximate regularity. Many growers who started to spray failed to maintain the applications.

When banana shipments to the United Kingdom ceased, the Imperial Government offered to purchase a maximum of 12,000,000 stems of bananas at a rate of 3*s.* per bunch. Arrangements have since been made with American fruit companies for the sale of some of the bananas that cannot be shipped to England, but the standard required for the American market is higher than that formerly required for the European, and spraying becomes more urgently necessary than ever.

Nederlandsche namen voor plantenziekten bij landbouwgewassen. [Dutch names for plant diseases of agricultural crops.]—16 pp., Wageningen, Ned. PlZiekt. Vereen., Veenman & Zonen, 1941. [Abs. in *Z. PflKrankh.*, lii, 7–8, p. 398, 1942.]

This list of the Dutch common names of plant diseases prepared by the Dutch Phytopathological Society deals for the most part with deficiency disturbances, viruses, bacterioses, and mycoses of agricultural crops. Further lists for garden crops and forest trees are planned.

Proceedings of the Association of Applied Biologists.—*Ann. appl. Biol.*, xxix, 3, pp. 322–332, 1942.

At the meeting of the Association of Applied Biologists held in London on 17th April, 1942, W. M. Ware discussed hop downy mildew (*Pseudoperonospora humuli*) and its control [*R.A.M.*, xix, p. 691, xxi, p. 245]. A correlation between wet weather and serious attacks of the disease was established in Kent in 1927, 1930, 1931, and 1941. Only in these years was the rainfall in both July and August above the average for south eastern England. Less damage was caused in 1941 than in the other years referred to, probably because of a more thorough application of control measures.

W. G. Keyworth briefly reviewed the present state of knowledge of hop *Verticillium* wilt (*V. albo-atrum*) [ibid., xix, p. 364], nettlehead [ibid., xix, p. 691], and mosaic [ibid., xvi, p. 836], and summarized the chief problems concerning these diseases that remain to be solved.

A. M. Massee reported, *inter alia*, various unsuccessful attempts to transmit hops mosaic and nettlehead by various insects, including both the hop flea-beetle

(*Psylliodes attenuata*) and the green leafhopper (*Empoasca flavescens*), considered to be vectors of both diseases by Continental workers.

H. Martin, dealing with the significance of the bio-assay in studies of fungicidal action, stated that two groups of factors affecting protective fungicides for foliage use are amenable to laboratory tests, viz., a quantitative group governing the amount and distribution of the protectant, and a qualitative group affecting toxicity, to which the term 'fungicidal value' is applied. The first group (including retention, coverage or penetration, and tenacity) is susceptible to physical and analytical examination; the second is more difficult, but at least two sets of factors may be distinguished, since the active fungicide is not always the actual chemical of the protectant. The evaluation of the toxicity of the active fungicide rendered available must involve methods of bio-assay. A standing committee of the American Phytopathological Society has undertaken to standardize the tests. These methods have as their object the exposure of organisms of standard biological history to known concentrations of the toxicant for a known period under standard environmental conditions. As a rule the result of each test is the number of organisms affected out of the total exposed, i.e., it is a quantal response for which statistical methods are available to correlate the results of different tests and to determine the significance of the pooled results.

The statistical treatment of the results of the bio-assay depends on the observation that a linear relationship may be deduced between a function of the concentration of the fungicide and its fungicidal effect, if the latter is expressed as normal equivalent derivations, to which C. I. Bliss added five and the term 'probit'. Parker-Rhodes has co-ordinated these observations by his 'theory of variability' [ibid., xxi, p. 422], and has established a theoretical basis for acceptance of the regression coefficient as a measure of the inherent toxicity of the protectant. The high potential value of the bio-assay is evident, but a simple correlation between toxicity as determined by its means and toxicity as determined by field performance can hardly be expected at present. General rules may, however, emerge which will in due course permit a reliable forecast of field performance by the summation of the results of laboratory tests, among which the bio-assay is of the first importance.

A. F. Parker-Rhodes gave an account of his new method of investigating the mechanism of fungicidal action [loc. cit.].

Finn (R. F.). **Mycorrhizal inoculation of soil of low fertility.**—*Black Rock For. Pap.* (*N.Y.*), i, 19, pp. 116–117, 1 fig., 1942.

In experiments at Warrensburg, New York State, during 1940 and 1941, the growth of white pine seedlings in boxes containing infertile clay-sand soil inoculated with known mycorrhiza-forming fungi [unspecified] was found to be significantly greater than that of uninoculated controls [cf. *R.A.M.*, xviii, p. 267]. The seedlings in the inoculated boxes, which developed mycorrhiza on 87 per cent. of the short roots, weighed 223·4 mg. per plant as compared with 155·4 mg. for those in the controls, which developed mycorrhiza on only 10 per cent. of the short roots; the seedlings in the inoculated series absorbed 2·05 mg. nitrogen and 1·52 mg. potassium per seedling as compared with 1·17 and 0·98 mg., respectively, for the controls. A characteristic yellow-green colour observed in the needles of the uninoculated seedlings is attributed to nitrogen deficiency.

Reed (H. S.) & Dufrénoy (J.). **Catechol aggregates in the vacuoles of cells of zinc deficient plants.**—*Amer. J. Bot.*, xxix, 7, pp. 544–551, 8 figs., 1942.

This paper gives a description of the coacervated catechol aggregates [*R.A.M.*, xxi, p. 536] observed in the vacuoles of hypoplastic cells of leaves and the post-meristematic cells of growing shoots of apricot trees affected by little leaf due to zinc deficiency and in the cells of the leaves of walnut trees showing the same disease.

That a pathological condition was present in the walnut leaves was also indicated by the escape of necrotic material from the cells and its accumulation in the intercellular spaces; gum was also present in the intercellular spaces adjoining badly affected cells.

SANFORD (G. B.). **Apical leaf speck of Potatoes.**—*Sci. Agric.*, xxii, 12, pp. 772-774, 1 fig., 1942.

Since 1938, potato plants growing near Edmonton, Alberta, in areas which, before being cultivated, were shallow depressions holding surface water in wet seasons, have shown a condition referred to as 'apical leaf speck'. In mild attacks the colour of the foliage and the yield of tubers may remain almost unaffected, but in more severe cases the vines are not very sturdy, the leaves and stems are chlorotic, and the length of the internodes is slightly increased. The tubers are generally small, but of normal shape. The early appearance of numerous very small, irregular, black dots or specks between the veins on the epidermis of apical leaves and, subsequently, the development of reddish-brown, necrotic areas of different shapes and sizes in the pith region of the top half of the stem are moderately constant diagnostic features. The necrotic areas usually appear at the nodes, but they may occur elsewhere; they develop first towards the top of the stem, are mostly absent in the lower half, and do not seem to form in the stolons or in the underground part of the main stem. Frequently the stem spots are visible by transmitted sunlight. All plants in an affected area develop the typical symptoms.

The disorder is not perpetuated by tubers from affected plants. When potato plants were grown in the greenhouse in soil from an affected area, the water content of which was subnormal, typical symptoms developed, but when the same soil was well watered, the pith and apical leaves remained normal, and no necrosis was observed in the tubers during storage. In two contrasting soil types, one high in organic matter but low in phosphorus and the other somewhat deficient in organic matter, potassium, nitrogen, and calcium, the plants grew well up to blossoming, when the reserve soil water apparently became deficient, and the condition appeared. The disorder is apparently caused by certain soil factors that favour faulty nutrition of the plant.

BALASHEV (N. N.). Вирусные болезни и явления вырождения Картофеля в Узбекистане. [Virus diseases and Potato degeneration in Uzbekistan.]—*C. R. Pan-Sov. V. I. Lenin Acad. agric. Sci., Moscow*, vi, 8, pp. 22–27, 3 figs., 1941.

Potato cultivation in Uzbekistan is stated to suffer severely from the gradual degeneration of imported varieties [cf. *R.A.M.*, xix, p. 359]. Thus, the yields of varieties Epicure, Lorch, and Wohltmann fell from 140, 192, and 181 zentner per ha. [zentner = 50 kg.] in the first year after importation to 68, 146, and 88, respectively, in the fourth year. The decline in productivity is coupled with a lower market value resulting from tubers of smaller average weight and deformed shape. In discussing the possible causes of this degeneration the author states that most of the well-known virus diseases occurring in Uzbekistan, such as mosaic, leaf roll, aucuba, and others, do not increase progressively from year to year and do not significantly spoil the appearance of tubers. On the other hand, two diseases, possibly due to one and the same cause as yet not clearly understood, were found to increase in violence from year to year.

The first of these two diseases, originally described by the author from Uzbekistan in 1938 (in '*Socialist Agriculture of Uzbekistan*', *1938*, 2, 1938) under the name of 'leaf-twisting' is stated to resemble spindle tuber and a disease described under the name of 'gothic' from the U.S.S.R. by Tereshchenko. It noticeably depresses the growth and the flowering capacity of the plant, causes the development of fewer

stems and of more lateral branches, and makes the leaves grow upwards. At the end of the season the tips of the stems and lateral branches may bend, becoming knotty and unelastic; and the blades of the leaves either curl up or fold up along the midrib, the margins becoming slightly wavy. The disease differs from leaf roll in that the upper, youngest leaves and not the oldest ones begin to roll up first, and that they do not become brittle; it resembles yellow dwarf in most symptoms, except that it does not produce chlorosis and extreme dwarfing. The diseased plants sometimes develop abnormally small leaves, which may exhibit symptoms of mosaic or severe necrosis. The symptoms of 'leaf-twisting' generally vary with the variety of potato and are not always all present at the same time. Tubers from diseased plants are elongated and often spindle-shaped or constricted in the middle, with numerous, very protruding eyes. In varieties with red or pink tubers the colour is paler in diseased plants. The percentage of cracked tubers in five varieties tested ranged from 1·4 to 28·2 in healthy as against 8·8 to 100 in diseased plants. The annual increase in the intensity of the disease was considerable in all nine varieties tested; in the variety Wohltmann the percentage of diseased plants rose from nil in the first year after importation to 88·3 in the fourth.

The second disease held responsible for degeneration in Uzbekistan and designated 'little leaf' is characterized by abnormally small and light green leaves with slightly wavy margins. In severely diseased plants leaves and sometimes stems dry off, beginning from the top of the plant downwards, and the plants are somewhat stunted. The yields of diseased plants are considerably lower than those of healthy ones, amounting, for the variety Epicure, to 23·7 and 28·9 per cent. of the healthy yield in early and late sowings, respectively. Furthermore, the disease causes a decrease in the number of tubers per plant and in the percentage of harvested tubers of marketable size. The percentage of Epicure potato plants affected by the disease was found to increase from 1·8 in the first year of importation to 74·7 in the fourth. It is concluded that 'leaf-twisting' and 'little leaf' are the two main expressions of potato degeneration in Uzbekistan and must as such be taken into account in potato certification.

HANSEN (H. P.). **Studier over Kartoffelviroser i Danmark II. Fortsatte Sortsundersøgelser.** [Studies on Potato viruses in Denmark II. Further varietal studies.]—*Tidsskr. Planteavl*, xlvi, 2, pp. 355–362, 1942. [English summary.]

Continuing his studies on potato viruses in Denmark [*R.A.M.*, xvii, p. 338], the writer examined apparently healthy plants of 15 varieties (11 immune from wart disease [*Synchytrium endobioticum*]) for the presence of spontaneous infection. Virus-free clones of Ackersegen, Direktor Johanssen, Di Vernon, Flava, Parnassia, Voran, Bintje, Sydens Dronning [Queen of the South], and probably Tylstrup Odin were obtained. Some of the clones of Parnassia, Voran, and Tylstrup Odin, and all those of Kerr's Pink and Majestic, contained virus X, which was also present, together with B [ibid., xix, p. 723], in every one of Kaiserkrone and Snowdrop, while Juli consistently harboured virus A. All the varieties reacted to virus Y with leaf drop streak or rugose mosaic, the symptoms in Di Vernon being very mild and indistinct. All the varieties under observation acted as symptomless carriers of virus X except King Edward (top necrosis) [ibid., xv, p. 310] and Juli (simple mosaic or crinkle associated with infection by virus A). Top necrosis developed in Ackersegen, Juli, Kerr's Pink, Bintje, King Edward, and Tylstrup Odin inoculated with virus B, the other varieties being symptomless, and the same symptoms appeared in Kerr's Pink and Sydens Dronning artificially infected with A, which induced crinkle or severe simple mosaic in Majestic, Parnassia, Snowdrop, and Tylstrup Odin (all generally containing X or X+B), the remainder being symptomless carriers of A (except for the immune Di Vernon).

Bonde (R.), Stevenson (F. J.), Clark (C. F.), & Akeley (R. V.). **Resistance of certain Potato varieties and seedling progenies to ring rot.**—*Phytopathology*, xxxii, 9, pp. 813–819, 1942.

Out of 54 named American and foreign potato varieties and 65 unnamed seedling varieties tested in Maine for their reaction to ring rot (*Phytomonas sepedonica*) [*Corynebacterium sepedonicum*], a major disease in 37 States [*R.A.M.*, xxi, p. 502], only two of the former were resistant, namely, the Dutch Friso and the British President, and two of the latter, arising from the progeny of crosses between S. 41956 and Earlaine, and Earlaine and 43055. In addition, nearly half the seedling varieties from the resistant President × susceptible Katahdin cross escaped infection, while a few selections from a cross between the two susceptible varieties 336–123 and 47156 were more resistant than either parent. From these limited experimental data the development of varieties resistant to ring rot would appear to be quite practicable.

Ryker (T. C.) & Chilton (S. J. P.). **Inheritance and linkage of factors for resistance to two physiologic races of Cercospora oryzae in Rice.**—*J. Amer. Soc. Agron.*, xxxiv, 9, pp. 836–840, 1 fig., 1942.

The resistance of the Blue Rose 41 rice selection to *Cercospora oryzae* race 1 [*R.A.M.*, xx, p. 490] was found at the Baton Rouge and Crowley (Louisiana) Experiment Stations to be governed by a single dominant factor, while the moderate resistance of the parent variety to race 2 of the pathogen is attributable to another single dominant factor. The parent Blue Rose variety occupies about 49 per cent. of the total rice acreage in the southern States and is highly susceptible to race 1. A close linkage was shown normally to exist between resistance to one race of *C. oryzae* and susceptibility to the other, but the progeny of crosses between Blue Rose and selection 41 comprised a very few individuals of homozygous resistance to both, giving hope of further developments in breeding along the same lines.

Teakle (L. J. H.). **Copper deficient soils in Western Australia.**—*J. Aust. Inst. agric. Sci.*, viii, 2, pp. 70–72, 1942.

In Western Australia the main soil groups deficient in copper [*R.A.M.*, xxi, p. 92] are (1) the cretaceous areas at Gingin and Dandaragan, (2) the south-west coastal districts, (3) the coastal sand hills, and (4) the sandy and gravelly soils of the wheat belt. The copper content of certain plants, e.g., subterranean clover (*Trifolium subterraneum*), wheat [see above, p. 17], or oats, indicates the copper status of the soils in which they are grown.

Under Western Australian conditions maximum responses are generally obtained from applications of 5 to 10 lb. copper sulphate per acre, or its equivalent. On very sandy and gravelly soils, maximum responses have been obtained from 2½ lb. copper sulphate per acre. On these soil types yields have sometimes been considerably reduced where even 5 lb. copper sulphate per acre have been applied. Although the copper sulphate is mixed with superphosphate, very small amounts may be toxic in soils low in organic or inorganic colloids. Where rainfall is higher, and on soils containing appreciable quantities of clay or humus, over 10 lb. copper sulphate per acre may be used without harmful effect, but also without benefit to yields. The residual value of small applications of copper is considerable, the succeeding crop sometimes making little or no response to further treatment.

Muhr (G. R.). **Plant symptoms of boron deficiency and the effects of borax on the yield and chemical composition of several crops.**—*Soil Sci.*, liv, 1, pp. 55–65, 5 figs., 1942.

At the Michigan Agricultural Experiment Station the writer carried out a series of tests to determine the characteristic symptoms of boron starvation and to secure

plant material for chemical analysis. Sugar and canning beets, maize, turnips, dandelions [*Taraxacum officinale*], barley, and winter wheat were grown in 1-gal. earthenware jars containing Thomas sandy loam, rutabagas [swedes] on Brookston clay loam, and mangels, radishes, and chicory in quartz sand cultures, boron being withheld from some and incorporated with the nutrient medium at varying rates in others. Supplementary field trials were conducted with both kinds of beet and with swedes.

Detailed descriptions of the symptoms induced by boron deficiency are given. In sugar beet an inverse relationship was found to exist between boron and iron and boron and nitrogen in the beet plant, and similar relationships were observed in swedes. In maize the boron-iron relations were again similar, but the nitrogen content was not affected by the variations in that of boron.

Hoerner (G. R.). **A study of spreaders for use on Hops in the field control of downy mildew.**—*Phytopathology*, xxxii, 9, pp. 820–823, 2 figs., 1942.

The use of spreaders is essential for the proper dispersal of the liquid sprays applied to hop leaves for the control of downy mildew (*Pseudoperonospora humuli*), and the writer therefore tested a number of preparations at the Oregon State College for their efficacy in this respect. In the laboratory satisfactory coverage of the under sides of excised leaves was secured by means of a small air-compressor, equipped with an oil and air filter, operated by a ¼ hp. electric motor. The more promising spreaders were subsequently given further trials in the greenhouse and field.

The most effective of the 36 adhesives tested were the rosin soaps [*R.A.M.*, xix, p. 616], at least six different formulas of which were compared, that finally selected for field use consisting of a stock solution prepared from 25 lb. rosin, 6 lb. caustic potash, and 25 gals. water. A minimum of 1 pint of stock solution should be incorporated with 100 gals. of any fungicide used in field operations.

Keyworth (W. G.). **Notes on Hop diseases in 1941.**—*Rep. E. Malling Res. Sta., 1941*, pp. 42–43, 1942.

In these notes on hop diseases in south-eastern England in 1941 it is stated that *Verticillium* wilt [*V. albo-atrum* and *V. dahliae*: see above, p. 33] was reported nine times. The disease remains a serious menace on many farms, and the control of large outbreaks is likely to prove very difficult and expensive. Evidence was obtained that the disease can be introduced into commercial gardens by the planting of infected sets.

Nettlehead [ibid., xix, p. 691] was found to be transmissible by grafting, and is, therefore, probably due to a virus. In very warm weather the symptoms are masked. Diseased hills should be removed whenever the symptoms are seen, starting very early in the season.

Fluffy tip [ibid., xix, p. 364] was widespread between 26th and 30th June, reports of its presence being received from places as far apart as Benenden, Maidstone, Penshurst, East Kent, and even the West Midlands. Both the Fuggle and Golding varieties were attacked, but the disease was less prevalent on the latter. In some gardens 50 per cent. of the bines were affected. On most farms the trouble did not persist, the bines growing away and leaving a 'short-jointed' portion where the check had occurred. Where the check to the bines was permanent they failed to make further growth, fell away from the string, and finally died back for several feet; on such bines, the laterals became reduced in size, and showed distorted leaves bearing ring-shaped, yellow markings and dead patches.

The first outbreak of chlorotic disease [ibid., ix, p. 742; xv, p. 257] to be recorded in south-eastern England occurred in 1941 in a Fuggle garden at East Peckham; previously the disease had been observed only in Worcestershire.

In one Fuggle garden split leaf blotch [ibid., xix, p. 364] caused heavy reduction

of crop. Mosaic was again prevalent in the Golding yards in the West Midland area. *Armillaria* disease [*A. mellea*: loc. cit.] was still present on hops planted three years before on the site of an old orchard, but repeated grubbing and replanting appeared to reduce the severity of the attack.

Reinmuth (E.). **Die parasitäre Blattdürre, eine für den Mohnbau bemerkenswerte Krankheit.** [Parasitic leaf desiccation, a noteworthy disease in Poppy cultivation.]—*Angew. Bot.*, xxiv, 3–4, pp. 273–277, 2 figs., 1942.

Although severe damage to the opium poppy [*Papaver somniferum*] from *Pleospora calvescens* (*Helminthosporium papaveris*) [*R.A.M.*, xvii, p. 96] has been reported of recent years from south-eastern Europe, notably Bulgaria, the foliar desiccation and browning for which the fungus is responsible has hitherto attracted little attention in Germany. In 1941, however, an outbreak of the disease occurred in Mecklenburg, chiefly on light soils, the symptoms first becoming noticeable during a dry spell in the latter part of June and steadily increasing in virulence. Infection originated at the stem base and was sometimes accompanied by damping-off of the underground system; black, necrotic lesions developed on the cortex at the points of insertion of the shrivelled leaves, which were occasionally replaced by adventitious leaflets. A few inflorescences attacked by *Trichothecium roseum* and *Aspergillus* as well as *P. calvescens* turned black and fell prematurely, but in general the heads were not extensively involved. Sections through the stems of old diseased plants revealed the presence of necrotic areas in the tissues near the vascular bundle ring. Typical conidia of the *Cylindro-Helminthosporium* subgroup were observed in profusion on the infected surfaces. *Cladosporium herbarum* was detected in the centre of the stigma in a few of the shrivelled capsules. *P. calvescens* probably demands warm conditions for its optimum development, and control measures (which should include seed disinfection with a mercurial dust and treatment of the growing plants with a copper containing fungicide) are briefly discussed in the light of these requirements.

Ekstrand (H.). **En sjukdom på Vallmo.** [A Poppy disease.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, v, 4, pp. 50–53, 4 figs., 1941.

During the summer of 1941 the fungus *Pleospora calvescens*, hitherto unknown in Sweden, was observed to be causing a disease of opium poppies (*Papaver somniferum*) in a fair-sized planting in West Gothland. The symptoms consisted of foliar discoloration, black spots on the stems and petioles, and wilting of the flower buds [see preceding abstract], late floral infections resulting in partial or total shrinkage of the capsules and disorganization of the seed embryos. There is reason to believe that the pathogen is seed-borne.

Abbott (E. V.). **Results of experience with chlorotic streak in Louisiana in 1941.**—*Sug. Bull., N.O.*, xx, 18, pp. 161–165, 1942. [Abs. in *Sugar*, xxxvii, 10, p. 44, 1942.]

In 1941 chlorotic streak reduced the acre yield of sugar from C[anal] P[oint] 28/19 by 26·6 per cent. and that from C.P. 29/320 by 56·6 per cent., thereby confirming the previous estimate of the potential importance of this disease on several commercial sugar-cane varieties grown in Louisiana. In both varieties the first stubble suffers much more severely than the plant cane. In addition to a rigorous programme of roguing and provision for ample supplies of healthy seed, hot-water disinfection of the seed pieces may be practised. C.P. 33/243 appears to be less susceptible to chlorotic streak than some other members of the same group, and it is unlikely that Co. 281 and 290 will sustain appreciable injury from the disease, which is carried by the common leafhopper *Dracculacephala portola* [*R.A.M.*, xxi, p. 266].

KARLING (J. S.). **The Plasmodiophorales.**—ix+144 pp., 17 pl., New York City, published by the author, 1942. $3.75.

Since the publication of W. R. I. Cook's monograph of the Plasmodiophorales in 1933 [*R.A.M.*, xiii, p. 60] several new genera and species have been incorporated in the group, the concepts of which have further been modified by some important new discoveries, making the present revision opportune, and in fact essential. Although the treatise is intended primarily for students of mycology, phytopathologists and other scientists are likely to be interested in the work, special features of which include diagrams of the life-cycles of various species and descriptions of two major diseases caused by members of the family, namely, club root of crucifers (*Plasmodiophora brassicae*) [a particularly full and valuable account of which is given] and powdery scab of potatoes (*Spongospora subterranea*), with supplementary data in each case on the geographical distribution of the pathogens and bibliographical references to the relevant literature. Among the other genera discussed are *Sorosphaera*, *Sorodiscus*, and *Ligniera* (with which *Rhizomyxa*, *Sorolpidium*, and *Anisomyxa* are probably synonymous), *Trematophlyctis* and *Pyrrhosorus* being regarded as of doubtful authenticity, while *Sporomyxa*, *Peltomyces*, and *Cystospora* are excluded from the family.

OVERHOLTS (L. O.). **The Polyporaceae of Pennsylvania III. The genus Poria.**—*Bull. Pa agric. Exp. Sta.* 418, 64 pp., 1942.

In the third paper of this series [*R.A.M.*, xiv, p. 795] the author gives a list of 69 species (including eight new ones) of *Poria* occurring in Pennsylvania. A key is provided and detailed descriptions given for all species. *P. callosa* is described as the cause of an important decay of coniferous structural timber, producing a brown rot in no wise different from that of *Trametes serialis*. *P. cinerescens* is stated to be of considerable importance as an agent of decay of conifer slash. *P. unita* (Pers.) Cooke, long known to mycologists as *P. medulla-panis* [ibid., xvi, p. 3] (a species that cannot now be identified), is common on hardwood structural timbers throughout the United States and Canada. Other species prevalent on structural timber are *P. vaillantii*, common in damp situations throughout the United States, and *P. incrassata*, one of the most destructive decay fungi, more or less confined to regions of high humidity, such as the southern States and the Pacific coast. The author confirms Campbell and Davidson's identification of the fungus causing the sterile conchs on birch as *P. obliqua* [ibid., xviii, p. 146].

DÉFAGO (G.). **Seconde contribution à la connaissance des Valsées von Höhnel.** [Second contribution to the knowledge of the Valseae von Höhnel.]—*Phytopath. Z.*, xiv, 2, pp. 103–147, 8 figs., 1942.

Continuing his studies in Switzerland on the Valsaceae [*R.A.M.*, xv, p. 447], the writer describes the morphological, physiological, and cultural characters of certain species to which special attention was paid, and discusses their taxonomy. The name *Valsa ceratophora* Tul. is maintained against *V. ceratosperma* (Tode) Maire [ibid., xvi, p. 562] on the ground that the application of the name *S. ceratosperma* Tode can now only be guessed at. The fungus is widespread throughout Europe, and has been observed by the writer on 24 trees and shrubs in the Lower Valais, the following hosts probably constituting new records: alder (*Alnus viridis*), quince, *Cytisus nigricans*, *Frangula alnus*, walnut (*Juglans regia*), juniper, damson, and yew. Though ordinarily a saprophyte on dead branches, the hyphae of the fungus have occasionally been observed to pass from a dead patch on the bark to the living tissues. The minimum, optimum, and maximum temperatures for the growth of a strain of *V. ceratophora* from privet on potato agar were 0°, 23°, and 34° C., respectively.

The structure and appearance of the fructifications of corticolous fungi are largely determined by their hosts: in the case of *V. ceratophora* and other species of *Valsa*,

Diaporthe, and *Melanconis* the features thus influenced include (1) the shape of the stroma and disk, which is rounded on young twigs, e.g., of rose, lime (*Tilia*), *Cornus*, *Salix*, but oval on branches or stems with a thicker rhytidome (birch, *Prunus*, walnut); (2) the site of the stroma and the mode of rupture of the periderm, i.e., transverse on *Prunus* and birch, longitudinal on the vine and other plants of which the bark ruptures lengthwise, and circular on one-year-old rose twigs; (3) the thickness of the stroma, which measures 1 mm. on twigs and 2 to 3 mm. in a thick cortex; the more resistant the rhytidome to penetration, the better developed is the stroma; (4) the colour of the disk, depending largely on the entostroma, which contains the remnants of the host; it is generally brownish, but may appear whitish, as on privet and beech; and (5) the number of perithecia, which corresponds with the volume of the stroma and ranges from three or four per fructification on a twig to 60 or 80 on a thick cortex. The length of the ostioles is increased by abundant humidity and probably by light, but ordinarily the perithecial beaks do not extend beyond the disk; Nitschke's erection of the subdivision *Euvalsa* for ten species with elongated ostioles (Pyrenomycetes germanici, 1867) is attributed to a misconception, the supposed specific character being merely an effect of environmental factors. The length of the axis of *V. ceratophora* was found to range from 26 (walnut) to 45 μ (*T. cordata*), with a mean from 32 to 35 μ, and the width from 3·5 to 7·5 (5) μ, the dimensions of the ascospores being 8 to 9 by 1·5 to 1·9 μ. The pycnospores of *Cytospora ceratophora* form glutinous, yellowish-white cirrhi (amber-yellow when dry), are borne on conidiophores, 8 to 12 by 1·5 to 2 μ, and measure 3 to 9 by 0·9 to 2·5 (4·8$\pm$0·64 by 1·47$\pm$0·11) μ. Nineteen specific names are relegated to synonymy with *V. ceratophora*.

V. cypri Tul. was found frequently after fire damage; its pycnidia, which have frequently in the past been identified with *C. pruinosa*, are here distinguished from it and renamed '*C. cypri* (Tul.) Défago'.

In 1823 Fries described *Sphaeria pruinosa* on ash, and since that time a very common *Cytospora* on ash has been variously known as *C.*, *Dendrophoma*, or *Cytophoma pruinosa*. After seven years' search the author has discovered its perithecia, the first time, so he claims, that they have been seen since Fries described them as *S. pruinosa* Fr.; he accordingly proposes the name *V. pruinosa* (Fr.) Défago. The genetic connexion between the two stages was established by pure cultures from asco- and pycnospores, both of which gave rise to yellow-brown colonies with few aerial hyphae and numerous pycnidia. The unilocular pycnidia of the asexual stage, designated '*C. pruinosa* nob. nec Sacc.' resemble those of *V. cypri* in internal structure, but are higher and narrower, besides being much more numerous both on the host, the periderm of which is sometimes extensively ruptured, and in pure culture. *C. pruinosa* has also been found on lilac, on which it must be distinguished from *V.* (*C.*) *syringae* Sacc., the latter being characterized by pluriloculate pycnidia and a well-developed, greyish ectostroma. *V. pruinosa* differs from *V. cypri* principally in its larger and more numerous pycnidia, perithecia, and asci, its smaller and broader ascospores, its higher temperature requirements, and its darker brown mycelium. Other species of *Valsa* occurring on ash include *V. syringae*, *V. mediterranea*, *V. leucopsis*, *V. grisea*, *V. fraxinina*, and *V. orni*, the taxonomy of which is briefly discussed: the last-named may be identical with *V. cypri*.

A fungus collected during five successive winters in larch forests agreed in the main with Nitschke's description of *V. curreyi*, but the presence at the base of the perithecial and pycnidial stromata of a black zone led the author to transfer it to the genus *Leucostoma* as *L. curreyi* (Nit.) nov. comb., the imperfect stage being designated *Leucocytospora curreyi* (Sacc.) nov. comb. (syn. *C. curreyi* Sacc.).

Leucostoma [*V.*] *cincta* has been found on two new hosts, *Cornus sanguinea* and quince, the latter having probably been contaminated by spores from adjacent peach branches. The fungus is very prevalent throughout Switzerland on hedges of *P. laurocerasus*, and cross-inoculations with strains from *C. sanguinea*, quince, and

P. laurocerasus were successful on *C. sanguinea*. Von Höhnel was probably right in his opinion that *V. macrostoma* Rehm nec Fuck. and *V. rehmii* Wint. are its synonyms.

Following the author *C. cincta* should be known as *Leucocytospora cincta* (Sacc.) von Höhn. *C. ambiens*, the pycnidial stage of *V. ambiens*, another common occupant of *Prunus* [ibid., xx, p. 6], differs from the foregoing in the absence of a basal zone and in having wax-coloured cirrhi. *L. persoonii* [*C. leucostoma*] is more nearly related to *L. cincta* than any of the other species on *Prunus*, but the pycnidia of the former are blackish and those of the latter brown, while the cirrhi of the two species are dark red and pale pink, respectively, and the pycnospore dimensions 5 to 5·5 by 1 to 1·2 μ and over 6 by 1·3 μ, respectively. *C. sydowii* Gutner (1934) is relegated to synonymy with *C. cincta*.

Since 1934 *V. leucostoma* has been observed on *Sorbus* [*Pyrus*] *aria*, *S.* [*P.*] *aucuparia*, *Cornus sanguinea*, and *Prunus lusitanica*. In his previous study the writer found that it comprises several physiologic races, and the question arose whether their thermal relationships are influenced by climatic conditions. The fact that a race of the fungus from *Pyrus aucuparia* collected at an altitude of 1,500 m. above sea-level required almost as high temperatures as those from central Valais or Japan (21° to 27° and 30°, respectively) for satisfactory growth would appear to exclude the environment as an important factor in this connexion.

Forbes (A. P. S.). **Some observations on the 'yellows' sulphur deficiency disease of Tea.**—*Nyasald agric. quart. J.*, ii, 3, pp. 20–26, 1942.

The 'yellows' disease of tea found in Nyasaland, where it is caused by sulphur deficiency [*R.A.M.*, xii, p. 537], shows four distinct stages, the symptoms of which are described.

Before 1932 a great deal of the tea in Nyasaland was planted in old rubber, coffee, or tobacco land naturally deficient in sulphur, and to which fertilizers were seldom applied. Since then most of the tea has been planted on virgin soil, but the disease still persists. Careless planting is also a predisposing factor, as it militates against the quick establishment of a healthy stand. High 'jat' bushes are more susceptible than low ones throughout their life. Excessive rainfall in any one season conduces to the development of the disease in high 'jat' tea in March or April but an application of sulphur-containing fertilizer in late February corrects the condition. Lack of moisture also conduces to 'yellows' attack in three to four weeks, while tea on 'bunds' and hard pans begins to show signs of the disease after quite a short period of drought. 'Yellows' symptoms appear much more quickly in young tea than old. Estates which cultivate deeply at least once a year seem to withstand conditions conducive to yellows much better than estates continually shallow-cultivated.

Any type of organic or inorganic fertilizer which contains sulphur in an available form or a form which becomes available will cure 'yellows' provided it has not reached the most advanced stage. Cattle manure and urine earth are particularly valuable in this respect. Urine earth is formed by putting 3 to 6 in. of soil on the floor of the cattle shed and placing the general bedding on top; if this earth is dug out every two or three months it forms a rich fertilizer of great value against 'yellows'. Fertilizers containing sulphur which becomes available only after a time-lag are useless in any area in which the disease is rapidly spreading. Time of application is important with young tea, which should receive two small applications rather than one large one. If a suitable fertilizer is applied every year, the disease is less likely to appear than if it is applied at irregular intervals. When available sulphur is insufficient, only light pruning should be practised.

Suitable fertilizers are ammonium sulphate, potassium sulphate, sulphur, cattle manure or cattle compost, and ordinary superphosphates. Observations showed that tea bushes cannot maintain a reserve of sulphur internally; available sulphur must always remain in contact with the roots. Providing that not too many conducive

factors are present, tea well-fertilized in the past can, apparently, be safely left unfertilized for two years, before any noticeable incidence of 'yellows' begins.

GADD (C. H.). **Report of the Mycologist for 1941.**—*Bull. Tea Res. Inst. Ceylon* 23, pp. 26–42, [? 1942].

In a report contributed by T. E. T. Bond it is stated that phloem necrosis has now been identified on 117 tea estates in Ceylon [*R.A.M.*, xx, p. 599]. Specimens received from an estate in the Passara district showed a peculiar undulate habit of growth; the shoots proved, however, to be free from necrosis, and the cause of their condition was not apparent. This wavy habit was probably confused with the zigzag condition, which is commonly, but not invariably, associated with phloem necrosis. Severely diseased bushes with curled leaves and zigzag shoots were often observed to give rise to apparently healthy shoots. On microscopic examination, however, such shoots were found to be heavily necrotic and cuttings propagated from them usually exhibit marked symptoms of disease and are indistinguishable from those obtained from other parts of the bush. Continued field observations at St. Coombs showed that the percentage of necrotic bushes in all the plots had increased by 10 per cent. during the year and now stands at 21 per cent. Some of this increase is attributed to an improved method of examining doubtful bushes, involving the stripping-off of small portions of bark from the stems (or roots, where practicable). By these means necrosis can often be detected when its presence in the leaf stalk is uncertain. The disease is stated to be generally increasing in severity and the symptoms becoming more strongly pronounced. The rate of increase in the percentage of necrotic bushes on a large plot in the Kandapola district amounted to about 1 per cent. of a total of 985 bushes per month, and thus corresponded closely to that calculated for the preceding two years. Roguing experiments commenced in the same district during the previous season were continued with good results, indicating that this is a feasible, if costly, method of control.

Records from several estates showed a marked decline in yield of the most heavily necrotic fields during the last ten years. Rigorous removal of non-productive bushes from such fields was found to be economically worth while. No definite cases of phloem necrosis were observed among 6- to 15-year-old supplies on several estates, and only one or two authentic instances have so far been found in young plants in the field. These field observations, which are likely to receive further confirmation from the experimental side, strongly suggest a possible immunity in high jat supplies. In experimental work the need of a reliable method of disease transmission is stressed. The interpretation of experimental results was further hampered by the unexpectedly widespread occurrence of various kinds of necrosis very similar to phloem necrosis in its early stages. The examination of nearly 250 root grafts, of which but few survived, showed that 12 out of 18 low jat scions were necrotic, while all the 16 high jat scions were still quite healthy. Pending final results, which are expected in about a year's time, it appears highly probable that the high jat material is immune from, or at least tolerant of, the disease.

'False necrosis', in which necrosis is confined to the leaves and no external symptoms appear, has hitherto been found in mature plants in the field, but this year it was observed to be widespread in various types of seedlings, particularly in those raised in peat, i.e., under somewhat abnormal conditions. There is no reason to believe that the condition is identical with phloem necrosis. Examination of young cuttings raised since the middle of the preceding year from necrotic bushes showed typical symptoms on all but a few, while no such symptoms were found on cuttings from healthy bushes and very little 'false necrosis' occurred on them.

The latest records of the oldest, nearly four-year-old, necrotic cuttings on their own roots showed them to be small and obviously diseased. The capacity of the disease

to reproduce itself in transplanted bushes, in cuttings, and in grafted scions to an indefinite extent, taken in conjunction with the available evidence from field observations and from experimental work, are considered to argue strongly in favour of a virus origin of phloem necrosis, although the data from graft transmission experiments are still not entirely convincing. Two theories, one postulating a deficiency of boron and the other an excess of chromium as causative agents of phloem necrosis, received no support from two experiments designed to test them.

FRAMPTON (V. L.). **A quantitative method for assay of Tobacco mosaic virus protein.**—*Phytopathology*, xxxii, 7, pp. 618–622, 2 graphs, 1942.

A quantitative method for the assay of tobacco mosaic virus protein by serological methods [cf. *R.A.M.*, xx, p. 316] is described.

STANLEY (W. M.). **The preparation and use of Tobacco mosaic virus containing radioactive phosphorus.**—*J. gen. Physiol.*, xxv, 6, pp. 881–890, 2 pl., 1942.

Healthy and mosaic-diseased Turkish tobacco plants were grown in sand and supplied with a complete nutrient solution containing radioactive phosphorus. Determinations were made of the distribution of the radioactive phosphorus. Both chemical analyses and radiographs revealed the same amount of phosphorus in the normal and infected foliage, some 30 per cent. of the radioactive phosphorus absorbed by the latter being combined with the purified virus isolated from the diseased plants. Following the inoculation of purified tobacco mosaic virus of high radioactivity into normal plants, most of the radioactivity was found to be associated with non-virus components, of which about 40 per cent. were in the inoculated and the remainder in the uninoculated portions of the plants. A small but significant amount of radioactivity (5·8 per cent.) was detected in the virus isolated from the uninoculated upper leaves.

KNIGHT (C. A.). **The physical and chemical properties of a distinctive strain of Tobacco mosaic virus.**—*J. biol. Chem.*, cxlv, 1, pp. 11–18, 1942.

The rib-grass (*Plantago lanceolata*) strain of the tobacco mosaic virus [*R.A.M.*, xxi, p. 227] was isolated from artificially infected Turkish tobacco plants and purified by differential centrifugation. The rib-grass strain resembled the ordinary virus in most of its physical and chemical properties, and serological tests showed the two viruses to have common antigenic groups, but each also possesses distinctive groups absent from the other.

KÖHLER (E.). **Ueber vergebliche Versuche, beim Tabaksmosaikvirus 'Mutationen' in Rohsäften zu erzielen.** [On unsuccessful attempts to induce 'mutations' of the Tobacco mosaic virus in crude juices.]—*Z. PflKrankh.*, lii, 7–8, pp. 392–395, 1942.

Negative results were given by all the writer's attempts to induce the development of yellow strains of the tobacco mosaic virus from green strains and vice versa through mutation by exposure of the infective crude juices to high temperatures (up to 85° C.). The 234 single infections produced by the treated juice samples on Samsun tobacco, *Nicotiana glutinosa*, and *Datura stramonium* were identical with those developing as a sequel to inoculation with the initial unheated virus.

SHAPOVALOV (M.), BLOOD (H. L.), & CHRISTIANSEN (R. M.). **Response of the Tomato plant to spacing.**—*Proc. Utah Acad. Sci.*, xviii, pp. 91–94, 1941.

Further data are given on the favourable response of curly-top tomatoes in the Hooper district of Utah to close spacing [*R.A.M.*, xxi, p. 103], the following yields being obtained during the five-year (1936 to 1940) series of experiments under discussion: 1936 (*a*) 42 in. apart, one plant per hill, 2·46 tons per acre; (*b*) same distance,

two plants (no figures given); (*c*) 21 in., one plant, 2·92 tons; (*d*) same distance, two plants (no figures); (*e*) 10½ in., one plant, 5·46 tons; the corresponding figures for the five treatments in 1937 were 4·32, 6·40, 6·40, 8·66, and 7·23 tons per acre, respectively; in 1938 for (*a*), (*b*), (*c*), and (*d*), 9·80, 10·74, 11·90, and 13·77 tons, respectively; in 1939 for the same four 11·30, 13·61, 15·48, and 17·35 tons, respectively; and in 1940 for all treatments 4·77, 10·38, 9·44, 12·99, and 14·40 tons, respectively. Taking $9.75 per ton as the average price of canning tomatoes and $3.00 per thousand as that of plants, and estimating the total extra cost of labour and plants at $40.00 per acre, the increased yields in 1937 and 1938 sufficed to cover the additional expenses of operation, while in the two succeeding years a clear profit was secured.

Bewley (W. F.). **Director's Report.**—*Rep. exp. Res. Sta. Cheshunt, 1941*, pp. 14–32, 1942.

In a trial at Cheshunt in 1941 of tomato varieties resistant to leaf mould (*Cladosporium fulvum*) [*R.A.M.*, xxi, p. 172], the Vetomold variety proved immune from attack and gave an average yield of 36·8 tons per acre. Neither of two Danish varieties Virum A and Virum B was immune, some plants showing high resistance, while others were as susceptible as ordinary commercial varieties. The Cheshunt variety Leaf Mould Resister No. 1 was highly resistant. Vetomold tomatoes also did well as an outdoor crop, one grower reporting some resistance by this variety to *Phytophthora infestans*. It appears to be well worth trial in any nursery where leaf mould is serious, especially as a late or second crop.

Swingle (R. U.). **Phloem necrosis: a virus disease of the American Elm.**—*Circ. U.S. Dep. Agric.* 640, 8 pp., 4 figs., 1942.

Phloem necrosis of the American elm (*Ulmus americana*) [*R.A.M.*, xix, p. 172], first observed at Ironton, Ohio, in 1918, but believed to have been present in several States for many years, is now known to be generally distributed in the southern halves of Ohio, Indiana, and Illinois, south-eastern Missouri, north-western Tennessee, Kentucky, and western West Virginia, up to 75 per cent. mortality from this source having been recorded in some localities during the past five years. The two specific, diagnostic symptoms of the disease are a yellow, yellowish-brown, or 'butterscotch' discoloration of the phloem of buttress roots or the lower trunk and a faint odour of wintergreen, the external features of foliar scarcity, chlorosis, desiccation, and defoliation being merely indicative. The means of spread of the causal virus under natural field conditions are unknown, but in Ohio, where the disease has been under close observation for several years, dissemination has been rapid, affected trees suddenly appearing at distances of 10 to 25 miles from any recognized focus. The infective agent is readily transmissible by grafting with bark patches or entire sections of roots and branches, specific symptoms developing within six months to two years in 75 per cent. of the trees grafted with diseased roots and in 90 per cent. of those into which affected branches or bark patches were inserted.

Gossard (A. C.) & Parson (H. E.). **Duration of the effect of zinc sulfate treatment on large, badly rosetted Pecan trees.**—*Proc. sth-east. Pecan Grs' Ass.*, xxxv, pp. 31, 33, 35–36, 1941. [Abs. in *Chem. Abstr.*, xxxvi, 15, p. 4660, 1942.]

Stuart pecan trees growing on Red Bay fine sandy loam developed rosette [*R.A.M.*, xix, p. 736] about two or three years after the application of oyster-shell meal at the rate of five tons per acre, the severity of the disease increasing annually to such an extent that in six or seven years after the treatment many of the trees were suffering seriously from die-back. A marked improvement was secured by soil applications of 5 or 20 lb. zinc sulphate per tree, a second treatment being given in the following year; the full corrective effect of the compound persisted for four to five years. More rapid, though less striking results were given by injections of 50 gm. zinc sulphate, the protection conferred by which, however, lasted for only about two years.

BINGHAM (T. R.). **Secondary fungi associated with White Pine blister rust cankers.**—Abs. in *Northw. Sci., Wash.*, xvi, 2, p. 39, 1942.

Among the secondary fungi observed in association with western white pine [*Pinus monticola*] blister rust [*Cronartium ribicola*] cankers in Idaho are *Tympanis hypopodia* Nyl. and *Dasyscypha* (?) *calyciformis* [*R.A.M.*, xvii, p. 422]. Organisms of this type are believed to play an important part in arresting the spread of the rust through the reduction of aecidial sporulation.

MCKENZIE (M. A.). **Experimental autoecism and other biological studies of a gall-forming Peridermium on northern hard Pines.**—*Phytopathology*, xxxii, 9, pp. 785–798, 2 figs., 1942.

The experiments herein fully described, dating from 1932 and 1934, relate to the inoculation of nursery stock of *Pinus sylvestris*, *P. banksiana*, and *P. rigida* with the aecidiospores of a gall-forming bark rust, provisionally referred to *Cronartium quercuum* [*R.A.M.*, xv, p. 124], collected in New York State and Massachusetts on the two last-named hosts. The binucleate spores were enclosed in aecidia produced by uninucleate mycelia, and germination was consistently effected by means of germ-tubes, neither basidia nor secondary spores having been observed. All the inoculated trees (12 of *P. sylvestris* and six each of *P. banksiana* and *P. rigida*) contracted infection, but galls were only formed on *P. sylvestris* into which aecidiospores from *P. banksiana* were introduced, the other hosts merely developing slight roughening, swelling, or discoloration of the cortex. Neither aecidia nor pycnidia appeared on the galls induced on *P. sylvestris*. The histological examination of the diseased bark revealed the presence of typical rust mycelia and haustoria. Microchemical tests on sections from the borderline of the advancing mycelium disclosed an abundance of starch, fat, resin, and tannin in recently infected tissues and those adjacent to them: after a lengthy period of infection the tannin content of the cells underwent a marked decrease.

In addition to cortical discoloration, galls, and profuse mycelial and haustorial production, some of the inoculated trees developed witches' brooms, while others sustained defoliation and death of the leaders or complete necrosis.

TRENDELENBURG (R.). **The reduction in time required for fungus tests on wood by means of impact bending tests.**—*Holz Roh- u. Werkstoff*, iii, pp. 397–407, 1940. [German. Abs. in *Chem. Abstr.*, xxxvi, 18, pp. 5628–5629, 1942.]

Wood-destroying fungi affect most strength properties of the substratum more rapidly than the weight. A method of testing preservatives is described involving the measurement of reduction in strength under impact bending after 30 days in preference to the estimation of loss in weight after four months. Two pieces, 8·5 by 8·5 by 120 mm., are exposed for 30 days to fungus cultures in Kolle flasks, then dried and broken, as also are two controls kept for the same period under humid but sterile conditions. Loss in strength up to 80 per cent. is obtained as against a reduction in weight of 10 per cent. This technique is equally applicable to tests of the natural resistance to decay of different kinds of wood.

Proceedings of the American Wood Preservers' Association, 1942.—610+xlvi pp., 1 pl., 76 figs., 56 graphs, 3 maps, Washington D.C., American Wood Preservers' Association, 1942.

This report of the 38th annual meeting of the American Wood Preservers' Association, held at Minneapolis on 27th, 28th, and 29th January, 1942, includes the report of a number of separate committees, dealing with preservatives, co-ordination and standardization of treatment specifications, the painting of creosoted wood, pressure and non-pressure treatments, and the uses of treated wood.

Mae S. Chidester, describing experiments on the effect of *Trichoderma lignorum* [*T. viride*] on loblolly pine (*Pinus taeda*) sapwood states that two wood-inhabiting strains of the fungus, when inoculated into *P. taeda* sticks, which were then placed in a room with 97 per cent. relative humidity, caused a consistent though slight reduction in fibre stress at proportional limit, modulus of rupture, work to proportional limit, work to maximum load, total work, and maximum crushing strength after one and three months' incubation; they caused no reduction in specific gravity or modulus of elasticity.

V. F. Hribar, dealing with the corrosion resistance of wood-preserving plant metals (pp. 171–206), states that corrosion is measured by loss of weight, visual observation, depth of pitting, or tensile strength, and presents a series of tables and photographs showing loss in weight (expressed in mg. per sq. in.) and the visual appearance of different metals for three types of immersion, (*a*) alternate, (*b*) partial, and (*c*) complete. From the tables given, readers can study their own particular problem, comparing the loss in weight of one metal for different preservatives and water at different temperatures.

W. McMahon, C. M. Hill, and F. C. Koch, describing greensalt, a new preservative for wood (pp. 334–348), its performance under test, and the technical aspects of its application, state that the name covers various mixtures of chromates, copper compounds, and arsenic acid. The composition chiefly studied by the writers is greensalt K. This consists of five parts of potassium dichromate, three of copper sulphate, and one of arsenic acid.

The resistance to decay of wood treated with this preservative was tested both in the field and in the laboratory. Small southern yellow pine [*Pinus* spp.] saplings about 1 in. in diameter and posts of the same wood 4 to 5 in. in diameter were treated with various concentrations and exposed in test plots, where they were kept under observation for seven years. Results with sapling tests showed 100 per cent. sound after seven years for 1 lb. per cu. ft. retention, as against 0 to 20 per cent. sound for four creosotes conforming to A.W. P.A. Grade 1 specification at 4 or 8 lb. per cu. ft. retention after five years. Laboratory tests demonstrated that while wood treated with greensalt is not completely immune from attack by some wood-destroying fungi under conditions ideal for decay, it compares well under similar conditions with wood treated with other preservatives.

G. Q. Lumsden & A. H. Hearn, describing the greensalt treatment of poles (pp. 349–364), state that the first commercial treatments under the supervision of the Bell Telephone laboratories were made in 1940, and by 1941 the preservative was recommended for the treatment of telephone poles for regular use. One advantage of greensalt-treated poles is that they are clean and can be painted readily. Following tests in 1938, a specification for greensalt-treated southern pine poles was drawn up, and arrangements were made with the telephone companies to instal about 2,400 treated poles. The specification contained four essential requirements: (1) the poles should be well air-seasoned before treatment; (2) penetration should be at least equal to that of the 8 lb. empty-cell creosoted pole; (3) the empty-cell process should be employed; and (4) retention should be a minimum of 1 lb. dry salts per cu. ft. wood. During 1941 some 15,000 southern pine poles were treated under this specification.

J. P. Wentling, reviewing developments in treating western red cedar [*Thuja plicata*] (pp. 409–418) poles, states that the latest and most promising developments in non-pressure, full-length treatment consist in the use of pentachlorophenol as a toxic agent, with a light distillate oil as a solvent and carrier. Made up ready for use, the treating solution consists of 90 per cent. solvent-carrier oil, 5 per cent. pentachlorophenol, and 5 per cent. plasticizer, added to prevent crystallization of the chemical on the pole surface. The solution is stable, and may be stored indefinitely.

J. J. Reid, in a study of several products of disco type low-temperature coal tar as wood preservatives (pp. 435–450), states that the disco process of low-temperature

carbonization of coal produces a kind of tar from which two types of wood preservative can be obtained. One is a brown, aqueous alkaline solution of high-boiling compounds, mostly relatively insoluble tar acids, which, impregnated into wood, acts as a non-bleeding preservative, a great part of which does not leach out under severe test conditions. The other is disco creosote, a distillate similar to the creosote from low-temperature carbonization. Tests established the effectiveness of adequate treatment with the former, while the latter compared favourably with high-temperature creosotes.

R. K. HELPHENSTINE, reviewing the quantity of wood treated and preservatives used in the United States in 1941 (pp. 498–522) [cf. *R.A.M.*, xxi, p. 109], states that the wood-preserving industry consumed 215,467,780 gals. creosote, including creosote coal tar solution, an increase of 23·39 per cent. over the figure for 1940. The industry used 1,403,863 lb. 'straight' and 4,382,561 lb. chromated zinc chloride, 1,656,014 lb. Wolman salts, 268,795 lb. zinc-meta-arsenite, and 310,921 lb. celcure.

G. B. SHIPLEY (pp. 534–559) gives a comprehensive review of the lumber, sleeper, and wood-preserving industry in the United States from 1890 to 1940.

The preservative treatment of fencing posts.—*N.Z.J. Agric.*, lxv, 2, pp. 85–91, 1942.

In this paper (contributed by the New Zealand State Forest Service) on the preservative treatment of fencing posts attention is drawn to the fact that, in the first place, only sound and properly seasoned wood should be treated. The preservative recommended is creosote, particularly the grade known as British Engineering Standard Specification oil. Brushing and dipping are inadequate; appropriate soakings are necessary. Tar is not recommended.

The open-tank process is the best for farm use. The simplest equipment consists of two 90 gal. steel drums, approximately 3 ft. 4 in. high and 2 ft. 4 in. in diameter. One is used for the hot bath, the other for the cold. They may be mounted on bricks, with a flue, or placed over a fire-pit dug in the ground. The posts are soaked in a drum of creosote at 180° to 200° F., and then transferred to 'cold' creosote (about 100°). The hot and cold effect may be secured by leaving the posts in the hot creosote and allowing it to cool off during the night. If necessary the oil should be re-heated to 100° before withdrawing the posts. The duration of immersion varies with the species and the amount of penetration and absorption required. The whole of the sapwood of the part in contact with the ground should be impregnated if possible, though a penetration of ½ to 1 in. may be acceptable. Lighter penetration is sufficient for the rest. Under these conditions a post absorbs ½ to 1 gal creosote.

A table is given showing the period of immersion required for different species of wood.

Distribution maps of plant diseases.—Maps 1–24. Issued by the Imperial Mycological Institute, 1942. 3*s.* 9*d.* (3*s.* 0*d.* to direct subscribers in the British Commonwealth).

The first year's issue of this series of maps showing the world distribution of major crop diseases comprises (1) *Synchytrium endobioticum* on potato, (2) *Erwinia amylovora* on apple, pear, loquat, etc., (3) *Xanthomonas vasculorum* on sugar-cane, (4) *Oidium heveae* on *Hevea* rubber, (5) *Hemileia vastatrix* on coffee, (6) *Cronartium ribicola* on pines and *Ribes*, (7) *Cercospora musae* on banana, (8) tomato spotted wilt on tomato, tobacco, pineapple, &c., (9) *Omphalia flavida* on coffee, (10) *Claviceps purpurea* on rye and other cereals, and grasses, (11) *Xanthomonas citri* on citrus, (12) *Urocystis cepulae* on onion, (13) *Monilia roreri* on cacao, (14) *Pseudoperonospora humuli* on hops, (15) *Phymatotrichum omnivorum* on cotton, (16) *Sphaerotheca mors-uvae* on *Ribes*, (17) Fiji disease of sugar-cane, (18) *Sphaerella linorum* on flax, (19) bunchy top of banana, (20) *Corynebacterium sepedonicum* on potato, (21) *Sclerospora sacchari* on sugar-cane, (22) *Sclerotinia fructigena* on apple, (23) *Peronospora tabacina* on tobacco, and (24) curly top of beet.